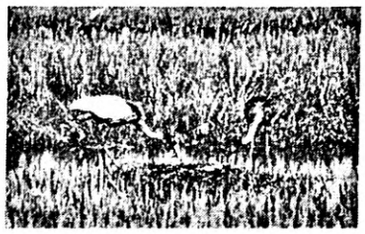
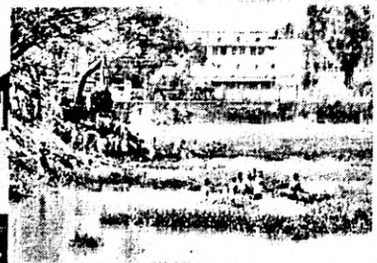
ANNUAL REPORT

2004-2005





Sálim Ali Centre for Ornithology & Natural History
Coimbatore 641108

ANNUAL REPORT

2004-2005

Sálim Ali Centre for Ornithology & Natural History
Anaikatty, Coimbatore 641108

CONTENTS

Director's note on the activities of the year 1

Research highlights

I. Avian ecology and endangered bird conservation 7

II. Man and biodiversity conservation 21

a) Environmental contamination and biodiversity 21

b) Conservation 23

III. Ecosystem studies 24

IV. Wetland conservation 34

V. Environmental Impact Assessment 36

University department 40

Seminars, workshops 42

Nature education programmes 47

Organisation 49

Staff of SACON 51

Infrastructure 52

Highlights of the achievements of the faculty 53

Publications 57

Appendix I. Members of SACON society 63

DIRECTOR'S NOTE ON THE ACTIVITIES OF THE YEAR

For SACON, the new year 2005 ushered in with a great sense of achievement; two of our books, namely 'Inland Wetlands of India – Conservation Priorities' and 'Inland Wetlands of India – A Conservation Atlas' were released by Mr A Raja, Hon'ble Minister for Environment and Forests, Government of India, at an impressive galaxy of dignitaries in New Delhi.

These publications are the final outcome of a project on 'Inland Wetlands of India' sponsored by the United Nations Development Programme (UNDP) and the Ministry of Environment and Forests (MoEF). The highlights of the publications are : identification of 655 wetlands from various biogeogrphical regions of the country for formulating a National Network of Wetland Conservation Areas; recognition of 199 wetlands across the country as qualified to be declared as Ramsar Sites as per Ramsar criteria; integrated land use maps showing wetlands above 2 ha from 72 districts covering 10 states; compilation of bird, reptile, fish and aquatic flora of Indian wetlands; maps showing spatial distribution of wetlands above 56 ha in all the states, using Space Applications Centre's data and making them available in public domain; environmental contamination in 170 wetlands, especially in fishes across the country; draft outline of a National Wetland Policy and Strategy and Action Plan for the next 15 years; a network of wetland working group across the country; and a team of scientists in the space research organizations on wetland related work.

The draft outline of the Wetland Action Plan emphasised the need for creating a National Wetland Register documenting all wetlands irrespective of their size, a national monitoring programme on alternative years involving local communities and school children and also advanced space application techniques, banning conversion of wetlands for any other land use, legally recognizing wetlands as a productive unit of land and include them in the land use classification, restoring the wetlands, prohibiting use of pesticides in the vicinity of wetlands which are used for drinking water.

The research projects of 2004-2005 covered a large spectrum of subjects from detritus dynamics of Keoladeo National Park to species and community ecology, ecosystems modeling and monitoring, environmental contamination and impact assessment, database and ENVIS centre and , to the use of advanced space technology for conservation programmes. On the whole this year, we executed 30 projects.

Endangered bird conservation programme maintained its pace of progress. Studies on the Nilgiri Wood Pigeon, a Globally Threatened species and, the Nilgiri Pipit, a Near-Threatened species show that for the former, conservation of evergreen and shola forests and, for the latter the grasslands in the higher hills, especially those in the sloppy marshes are vital for long-term conservation. Anthropogenic disturbances during the nesting period were recorded for both the species.

Greyheaded Bulbul, a Near Threatened species, preferred evergreen forests within an altitude of 500-1000 m. Breeding in loose colonies, they migrate to forests in lower elevations during non-breeding season, making it obligatory to cover these forests also in the conservation programme for the species.

The Lesser Florican project did not yield much data during the year, as the assessment of the population was difficult because of scattering of the birds due to erratic monsoon. Survey in the grasslands of Junagadh and Rajkot brought out a new site of the Florican at Amreli.

Edible-nest Swiftlet's population continued to grow in one of our study areas in the North Andaman. Nearly 100 adults and 229 chicks were ringed. Recovery includes those ringed during 2001, 2002 and 2003. 50 eggs were transferred to the nest of the Whitebellied Swiftlet for foster incubation and care, as a part of the ex-situ conservation programme.

A project to assess the impact of earthquake and tsunami on the Nicobar Megapode and other endemic avifauna of the Nicobar Islands was launched three months after the holocaust, with the financial support from the Wildlife Trust of India. Since, SACON had a project on the Megapode during 1992-1999, such an assessment would bring the actual damage.

Hornbill Conservation programme continued with the assessment of the status of hornbills in some additional areas in the Western Ghats, thus covering a total of 456 sq km in Kerala, Tamil Nadu, Karnataka and Goa. The Great Pied Hornbill and Indian Grey Hornbill were rare. In the Eastern Ghats, only the Indian Grey Hornbill and Malabar Pied Hornbill were recorded; the former was more common.

Bird Community study in the Silent Valley National Park showed variation in the species diversity and richness according to the season. The latter was inversely proportional to rainfall. In the higher altitudes, although the number of species was fewer, the density of the endemics and threatened species, especially the Nilgiri Laughing Thrush, was more.

Study on the avian diversity of the Andaman Islands, being funded by the Department of Biotechnology, recorded 53 endemic species with three new additions to the avifauna of the islands. The Data Deficient Andaman Crake and, large flocks of rare Andaman Teal were sighted; the latter in the Jarawa Reserve. The association of bird communities and endemic species with their respective habitats has been delineated and point database generated and incorporated with land use/ land cover map.

Andaman Crake whose ecology and "private life" were totally unknown, began to unfold, rewarding the untiring efforts of our team. Five pairs were located, banded and their ecology and behaviour are being documented.

Database on Indian Ornithology is getting further expanded to cover all required details of each species, including ecology and behaviour. This ambitious, user-friendly database as it develops, shows that it will be an inevitable resource for any ornithological studies in the country.

Long-term monitoring of the ecology of the dry mixed deciduous forests in Anaikatty continued with the monitoring of the abundance of bird, herpetofauna and butterflies. A programme to monitor the vegetation changes in the area was introduced during the year. Intensive studies on the Whiteheaded Babbler, Indian Robin and House Sparrow were continued. A preliminary study on the status and ecology of the Peafowl and Pied Bushchat in the campus was also completed. A short-term ecological investigation on the three common bulbuls of the campus, namely Redwhiskered, Redvented and Whitebrowed bulbuls is underway.

Studies on the ecology of the breeding wetland birds at Kumarakam, one of the fast developing tourist centres in Kerala, report the breeding of 10 colonial nesting species with more than 1000 nests. Nesting of the Blackheaded Ibis was recorded for the first time in Kerala with 64 nests. Heronry was dominated by the Little Cormorant. As they feed in the agricultural fields in the adjacent areas, pesticides and land use alterations may pose threats to these birds.

Toxicology division continued with monitoring of contamination levels in the Indian avifauna subjecting 218 birds from different parts of the country. 130 birds including the Whitebacked Vulture were victims of kite flying in Ahmedabad. Tissues and blood samples of five Whitebacked Vulture from Gujarat are being assessed for diclofenac and other environmental contaminants.

Koel, Common Myna and Common Bush Quail from agricultural areas in Coimbatore showed endosulfan, dieldrin and chlorpyrifos. Dieldrin poisoning was recorded in the Shikra from the outskirts of Coimbatore.

As a continuation of documenting programme of the contamination levels in the marine fishes in the Coimbatore market, 620 fishes of 16 species were collected during the year and are being analysed for certain organic contaminants. Their suitability for human consumption is also being evaluated. Levels of heavy metals in the marine fishes were already reported last year.

One of the more significant study initiated in the ecotoxicology laboratory during the year is assessing the ill effects of pesticides in women working in plantation sector, in collaboration with a medical doctor and is being supported by the Mc Arthur Foundation, Chicago.

Modeling the wetland ecosystem of Keoladeo National Park with the massive data collected by a team of scientists during 1981 – 1991, under the aegis of the Bombay Natural History Society, supported by the US Fish and Wildlife Service is in the final stage of completion. The

predictive model will be tested with the data being collected currently, after 15 years of the major study.

Monitoring the Keoladeo National Park Ecosystem continued for the second year. The Park received 1.04 tonnes of fingerlings through 19 mcft of water released from Ajanbund during the year. As the quantum of water was very little, the Park experienced almost a drought situation. Population of waterfowl was an all time low; just around 5372 birds, as against the 20-25 thousand of the 1980s. Most areas of the park was colonized by the weed *Prosopis juliflora.*

The project on structural and functional attributes of the wetlands of Indo-Gangtic plains progressed well, documenting the land use pattern, especially the wetlands, using satellite imageries and Survey of India maps. Waterfowl data of 2005 from various locations show a discernible decline from 1999; increase was noted only in the population of the Bronzewinged Jacana and Blackwinged Stilt. These indicate eutrophication, increase in the density of vegetation and contamination of aquatic system.

The GEF PDF-A project on conservation and sustainable use of wetlands had extensive consultation with various stakeholders, and chose two wetlands one in Etawah / Mainpuri, Uttar Pradesh and the other in Villupuram, Tamil Nadu. The project is to demonstrate sustainable use of wetland resources with the participation of local communities. Detailed project proposal is being finalized.

Ecological studies on the mammals, birds, herpetofauna and butterflies in the Teesta River Basin in Sikkim show that mammals, herpetofauna and butterflies were high in the lower altitudes although disturbance was high. However, mid and higher altitudes (2000 – 4000m) had more habitat specialists, especially birds and small mammals and hence, demand appropriate conservation measures.

Reptiles of Eravikulam National Park in Kerala, according to our study show very narrow niche- breadth indicating their habitat specificity.

Environment Impact Assessment team gave recommendations to mitigate the impact of the Barh Super Thermal Power Project of the NTPC in Patna, on the avifauna of the area.

On the ecotourism project of the Government of Kerala in Pathiramanal Island, in Alappuzha district, it is suggested that the island be left as it is, without any human settlement. In case of the implementation of the tourism project, the number of tourists to the Island be limited and they be taken only through the nature trails. Neither any buildings constructed nor night stay permitted.

The EIA team continues to monitor the conservation programmes of Madras Aluminum Company in the Kolli and Yercaud hills where they had mined for bauxite.

The environmental assessment of Bharathapuzha river basin in Kerala initiated in 2004, focused on collecting secondary data on the various projects implemented in the environs of the river. The present study will give a strong foundation for a full-fledged investigation on the impacts of development projects, especially hydroelectric, on the ecology of environs of the river Bharatapuzha.

The Nature Education Programmes of SACON continued its focus on school children, college students and general public. One of the major events of the year is the Children's Ecology Congress, the first of its kind in the country. 35 student research projects involving 110 students were presented in a professional manner. 30 movies were screened by the Centre for Media Studies, New Delhi at the VATAVARAN Film Festival for students organized by SACON. It was attended by more than 3000 students.

The Sálim Ali Nature Club Network for the schools covered 102 schools during the year as against the 79 of the last year. One-day Nature Camps at SACON campus, monitoring of common birds of Coimbatore with a participation of 500 students, nature exhibition, Salim Ali Rolling Trophy competitions were the major activities of the Club. The Trophy was won by the SBOA Matriculation Higher Secondary School, Coimbatore for the fourth consecutive year. The Best Bird-Watcher of the year for juniors was Ms. Muthulakshmi, Std VII, PSGG Kanya Gurukulam Hr. Secondary School and for Seniors Mr Anbarasan, STd IX, Govt. High School, Devarayapuram, Coimbatore. College Nature Club activities were focused mainly on documenting and monitoring biodiversity in the campus and urban wetlands.

The university programmes with affiliation to the Bharathiar University continued. SACON had 33 students during the year; 20 for Ph.D., 10 for M.Sc. and three for M.Phil. One Ph.D., all M.Phil. and nine M.Sc. students completed their studies and submitted the theses.

The Ministry of Environment and Forests, continued to provide financial support.

May 2005

V S Vijayan
Director

RESEARCH HIGHLIGHTS

I. AVIAN ECOLOGY AND ENDANGERED BIRD CONSERVATION

It is reported that the world loses about 1,70,000 sq km. of tropical forests every year and the extinction rate of species is 25,000 times the natural rate. Of the 9,723 bird species of the world, around 1,100 are globally threatened. In India, of the 1,295 species, around 78 are threatened. In this background SACON launched an Endangered Species Programme focusing on the status, distribution and ecology of the species concerned in order to formulate long-term conservation programmes.

1. Status and Ecology of the Nilgiri Wood Pigeon and Nilgiri Pipit

Principal Investigator	: Lalitha Vijayan
Research Fellows	: S. Somasundaram & J. Umamaheshwary
Project period	: October 2001- March 2005
Budget	: Rs. 8,39,600/-
Funding source	: MoEF, Govt. of India

The Nilgiri Wood Pigeon *Columa elphinstonii* and Nilgiri Pipit *Anthus nilghiriensis* are two of the 16 bird species endemic to the Western Ghats. The Nilgiri Wood Pigeon is Globally Threatened while Nilgiri Pipit is Near-Threatened.

Objectives

1. Determine the status of the rare endemic birds of the Western Ghats, namely the Nilgiri Wood Pigeon and Nilgiri Pipit.

2. Identify the key factors affecting the survival of these species and suggest management options for their conservation.

Studies on the Nilgiri Wood Pigeon (NWP) was conducted in the southern part of the Western Ghats, namely Upper Palni hills and, seasonally in Silent Valley National Park in the Nilgiris with intensive studies at Kukkal in the Kodaikanal forest division. Nilgiri Pipit (NP) was studied in the Upper Nilgiris with intensive observations in Upper Bhavani and Bangithapal (Mukurthi National Park). Studies on various aspects of the ecology and biology of these species were conducted during 2002-2005 following standard methods. Summary of the findings are given below

Nilgiri Wood Pigeon

Status and distribution

1. Surveys were conducted in the Western Ghats parts of Kerala, Tamil Nadu, Karnataka and Goa. The Nilgiri Wood Pigeon (NWP) was recorded in Silent Valley National Park, Siruvani, Castle rock, Mathikettan shola, Eravikulam National Park, Mannavan shola, Mukurthi National Park, Thai shola and most of the sholas in the Upper Palni Hills. It was not recorded in Goa during our survey.

2. Preferred habitat of the NWP was shola followed by evergreen forest. In the 158.5 ha of evergreen and 166 ha of shola forest surveyed in four states, 17 and 41 NWP were found in the respective habitats. Sighting frequency increased with size of the forest patch, encounter rates being 0.24 bird/ ha in shola and 0.10 bird/ ha in the evergreen forest.

3. In the intensive study area, the maximum number of birds (51) was recorded in May 2004 and minimum (8) in September 2002; abundance correlated significantly with fruit abundance ($r = 0.49$, $p < 0.01$). During the breeding season 32 breeding pairs were observed in 40 ha.

4. NWP was very rarely recorded in the plantations, that too only on the edges of the shola.

Foraging ecology

1. In total 1520 foraging observations were made. Seventy percent of the diet of the NWP was fruits of 34 species of plants, four species of flower and leaf buds. Nine species of plants were used more often (47% of observations) and mostly of Lauraceae. In the 134 faecal samples collected, seeds of 13 plants were identified. Totally 23 species of trees were with fruits during the study period; 85 individuals of 6 species in the peak fruiting period (August). The number of fruiting species and fruit abundance correlated significantly with rainfall in the intensive study area ($r = 0.95$; $p = 0.012$).

2. NWP fed on ground invertebrates during monsoon which correlated with the abundance of ground invertebrates ($r = 0.65$, $p < 0.01$).

3. The principal feeding technique was gleaning (76.25 %) followed by leaping (20.75 %). There was no significant difference in the method within and between seasons.

Breeding biology

1. Nesting habitat

a) Nilgiri Wood Pigeon nested in loose colony inside the forest, mainly in shola forest

b) During the two years of study, 108 nests were observed; 103 in Kukkal shola, three in Thai Shola (Nilgiris), one each in Silent Valley National Park and Muthikulam reserve forest in Siruvani.

c) No nests were observed in plantations (wattle, pine, eucalyptus and coffee).

2. Nesting season

Nesting was from February to September with peak in March - April.

3. Nest and nest - site characteristics

a. Nest was a platform of twigs placed between 4 and 8m in medium sized trees nearer to the streams or any other small openings.

b. *Turpinia nepalensis* had the maximum number of nests (22.55 %) followed by *Viburnum cylindricum* (11.76 %), *Phoebe paniculata* (9.80 %) and *Neolitsea zeylanica* (8.82%).

c. Important features differing significantly between the nesting and random sites were canopy cover, nest concealment, distance to water, tree canopy cover, tree height and ground cover.

d. Principal component analysis of the nest-site characteristics showed that first component was closely associated with nest tree height and nest height.

4. Nesting cycle

a. Clutch size was only one; both the parents took part in nest-building and feeding chicks; incubation period was 15.89 ± 2.3 and nestling period 15-19 days (16.89 ± 4.4; $n = 12$).

b. Nesting success was 14.43 %; productivity was very low (one chick for 7 breeding pairs) mainly because of predation; both natural and human (mainly egg collection by local people). Nests nearer to the forest edge were more prone to human predation.

c. Thickness of nesting branch and climber cover on the nest tree and, distance to trek path significantly influenced the nesting success.

Activity budget and pattern

The Nilgiri Wood Pigeon spent maximum time for foraging (45.5 %) followed by maintenance (30 %). Resting (16.25 %) and territorial behaviour were low (6.75 %). Territorial behaviour was seen during summer, first monsoon and winter. During late winter the pre- nesting activities such as pair formation, calling, display were noted.

Nilgiri Pipit

Status and distribution

1. Surveys were conducted in the grasslands of the regions surveyed for the Nilgiri Wood Pigeon (shola-grasslands; grasslands in the environs of evergreen, semi evergreen, moist deciduous forests), areas and the Nilgiri Pipits were recorded in Siruvani, Silent Valley National Park, Munnar and Eravikulam National Park. The maximum encounter rate was 0.4/ha in Upper Bhavani and minimum in Upper Palnis 0.04/ ha; the sightings were between 1000-2300 msl with significant correlation with altitude (Z = 0.489; P <0.018).

2. The major habitat of the Nilgiri Pipit was marshy grass slopes with creeping grasses and herbs such as *Eragrostris nigra, Isachaemum kunthiana, Myriactis whightii, Gentiana quadrifaria, Anaphalis* spp., *Eriocholon* sp. They were rare in disturbed grasslands with plantation.

3. Population in the intensive study area was maximum (0.9 bird/ha) in April 2003 and minimum (0.07/ha) in October 2002. At the nesting area the density was high (3/ ha) during nesting.

Foraging ecology

1. Feeding of the Nilgiri Pipit was observed 12, 988 times. Short grassland with creeping grasses was the most used (92%) feeding habitat. Preferred feeding height was 0-5cm (43%), but it varied with the height of grass, which varied with the season.

2. Five different types of substrates were used, namely air, fern foliage, grass and herb foliage, ground, and logs. Most used substrate was grass and herb foliage (95.9%)

3. Four types of feeding techniques, namely gleaning, reach up, leaping and lunge were used; gleaning was the maximum (92%). Seasonal variation was significant.

4. Food of the Pipit consisted of insects belonging to the orders of Diptera, Lepidoptera, Coleoptera, Orthoptera and to some extent other invertebrates including larvae and nymphs. It took grass seeds during winter, mainly of *Eragrostris nigra* and, *Isachaemum kunthiana.* 14% of seeds and 86% of invertebrates were consumed during breeding season, while it was 68% and 32% respectively during non-breeding season.

5. Mean feeding rate was 9.25/minute with bimodal peaks, morning and evening. The rate was higher during monsoon and winter with the ease in picking up grass seeds.

6. Usually the Nilgiri Pipit fed in pairs, occasionally in association with other species. The most associated species was the Pied Bushchat followed by Paddyfield Pipit, Tickell's Leaf Warbler, Prinia and Great Tit.

Breeding biology

1. Nest and Nest-site selection

The Nilgiri Pipits bred in short grasslands in marshy area. Nests were built inside the depressions under the grass tussocks *Andropogon* spp.; the nest was made of grass roots and lined with smooth grass blades and roots (*Fimbristylis*). The mean nest height was 17.44 cm above ground; mean length 11.12 cm; width 6.44 cm; and the height 5.16 cm.

Distance to water (river/stream), grass and herb cover over nest and grass height over the nest were the significant factors in determining the site.

2. Breeding season

The Nilgiri Pipit nests between March and June with a peak in April, a second brood is observed once.

3. Nesting cycle

a. The Nilgiri Pipit is strictly monogamous with small territory (Mean=3; No=9)

b. Mean clutch size was two; (range 1-3). Incubation only by female; mean incubation period 14-15 days; nestling period 15-16 days , brooding mainly by female, fed by both parents from within the territory.

c. Nesting success was 16.66%, 72.22% and 37.50% in 2002, 2003 and 2004 respectively.

Activity budget and pattern

1. Feeding was the most performed behaviour followed by parental care and flight maintenance; feeding rate was higher in winter.

2. Wake up and roosting time varied with season corresponding with sunrise and sunset. Roosting area was inside the marshy grasslands (stream banks) with high density of grasses and herbs.

Conservation problems and suggestions

Major threats

- Major threats common to both the Nilgiri Wood Pigeon and Nilgiri Pipit are habitat loss and degradation.
- Hunting of the Nilgiri Wood Pigeon and collection of its eggs are reported throughout its range.
- Fire in the grassland and reclamation of marshy areas, the specific breeding habitats of the Nilgiri Pipit, pose serious threats to the survival of this species.

Measures proposed

- A long-term monitoring of the habitat and population of the Nilgiri Wood Pigeon and Nilgiri Pipit has to be launched on priority.
- With the data already collected during the project and with the help of GIS & Remote Sensing data, a habitat modeling for both the species could be made which would make the monitoring easy, time saving and less expensive.
- Such a programme would help conserve almost all other endemic species of birds of the Western Ghats, as it include shola, evergreen forests and the grasslands.
- Sholas in the Upper Palnis have to be fully protected for the endangered Nilgiri Wood Pigeon and other endemic birds.
- Increasing the extent of the existing protected area in the Upper Nilgiris has already been recommended by us for the conservation of the endangered Nilgri Laughing Thrush; this will also help the Nilgiri Pipit.
- Restoration of natural habitats through community participation, reduction of cattle population through eco-development programmes a complete ban on the expansion of the plantations; need to be taken up immediately. These recommendations were already made in our earlier studies.
- Protection of habitat from fire and control of grazing at least during the breeding season (February to June) of the Nilgiri Pipit and other grassland birds.
- Taking into consideration of the low population, restricted range of distribution and the rarity of the habitat, especially for breeding, the Nilgiri Pipit needs to be included under the 'vulnerable' category of the IUCN.

2. Status, Distribution and Ecology of the Grey-headed Bulbul *Pycnonotus priocephalus* in the Western Ghats.

Principal Investigator	: V S Vijayan
Research Fellow	: P Balakrishnan
Project period	: February 2002-August 2005
Budget	: Rs. 4, 64, 040/-
Funding source	: MoEF, Govt of India

Objectives

1. Determine the current status and distribution

2. Study the ecology
3. Evolve a conservation programme for the species

The Grey-headed Bulbul *Pycnonotus priocephalus* is one of the 16 restricted range bird species of the Western Ghats. Very little information was available on status, distribution, natural history, habitat requirements and the factors causing endangerment of the species. A survey was conducted from Goa to Kanyakumari to assess the status and distribution. Ecological studies were conducted at the Silent Valley National Park, which supports a considerably large breeding population. The aspects covered include the foraging ecology, phenological patterns of major food plants, breeding biology and habitat requirements.

Grey-headed Bulbul is a rare specie; the average encounter rate being 0.19 bird/km in a 728.5 km surveyed in 24 areas across the four south Indian states. Large stretch of evergreen forests with in 700 - 1000 m was the preferred habitat. The encounter rate (0.33 bird/ km) in the evergreen forests below 1000 m was significantly higher than that in any other habitat type and elevation.

Grey-headed bulbuls forage in pairs or in groups on a wide variety of fruits and arthropods. Major component of the food comprises fruits during both breeding and non-breeding seasons. Foraging activities are confined more on the edges, where the fruits of sub-canopy trees and shrubs are abundant. The optimal foraging zone is between three and five meters on trees with an average height of four to eight meters. The birds forage more in the upper and middle edges of the canopy. A significant difference was found in the mean height of trees used for foraging (6.63 $\pm$ 3.68 and 4.90 $\pm$ 2.77, Mann-Whitney U test: $Z = -12.085$; $p<0.001$) and the mean foraging height (3.18 $\pm$ 1.46 and 2.77 $\pm$ 1.24, Mann-Whitney U test: $Z = -10.071$; $p<0.001$) during the breeding and non-breeding seasons. During the breeding season, the birds forage more in the upper canopy of taller trees, while during non-breeding season they do so in under storey shrubs. *Symplocos cochinchinensis, Symplocos racemosa, Litsea floribunda, Syzygium palghatense, Syzigium cumini, Viburnum corriatum, Maesa indica, Clerodendrum viscosum* and *Callicarpa tomentosa* are the major fruits devoured by Grey-headed bulbul. Gleaning is the most preferred foraging maneuver followed by reach, hang and sally.

Twenty nests of Grey-headed Bulbul were recorded during the last breeding season (January-May). All the nests were recorded from the Silent Valley National Park. No nests were recorded from the Karuvarakundu Reserve Forests of Nilambur South Forest Division, where the species was recorded nesting during 2003 and 2004. Most of the nests, 14 out of twenty, were recorded from the *Strobilanthus* patches. The clutch size varied from one to two. Nest losses were higher during this season compared to the previous breeding seasons. The intermittent rain in March might be one of the causative factors for higher nest losses. Only one chick was fledged out from twenty nests. The incubation period was 13 days and the fledgling period 12 days. Preferred nesting plants are *Ochlandra* sp., saplings of *Syzigium* sp., *Calamus* sp., *Strobilanthes* sp., *Saprosma* sp., and *Laseanthus ciliatus.*

The analysis of data on various aspects of the habitat requirements, phenology and fruit morphology of food plants and nest success in relation with the microhabitat tructure are in progress and the final report will be submitted to MoEF by the end of October.

3. Status and ecology of the Andaman Crake

Principal Investigator	: Lalitha Vijayan
Research Fellow	: N. Ezhilarasi
Duration	: 3 years
Commencement	: February 2004
Budget	: Rs. 8.19 lakhs
Funding Agency	: MoEF, Govt. of India.

Objectives

1. Assess the status of the Andaman Crake and document its ecology and biology.
2. Identify crucial areas for the conservation of this species and suggest probable measures

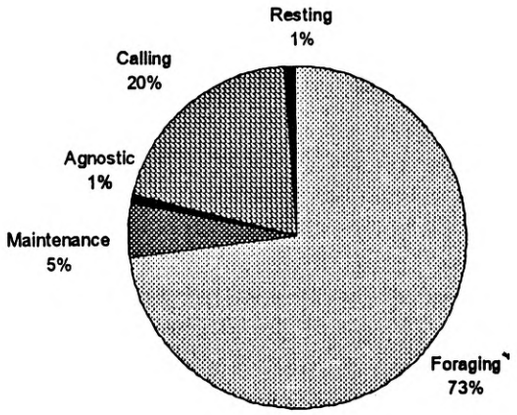
for conservation and management.

The Andaman Crake *Rallina canningi* is a rare endemic bird of the Andaman Islands and one of the two data deficient species of birds in India according to Bird Life International. Hence, a study was taken up on the ecology of the species. After a preliminary survey, intensive studies have been conducted in the Chidiyatapu Biological Park, 25 km away from Port Blair in South Andaman. This park is about 40 ha composed of Littoral forest with adjacent mangroves, Andaman moist deciduous forest and Andaman semi-evergreen forest. Fieldwork was carried out from March to May 2004 and August to October 2004 spending 520 hours. The results obtained in April-May and August-September-October were pooled together and analyzed for summer and monsoon respectively.

Totally five pairs of the Andaman Crake were observed, four pairs were colour-marked and watched intensively. The Andaman Crake is found at coastal wetlands such as lagoons, bays, salt marshes, tidal creeks, mudflats and mangrove swamps, and in forest habitats. The forest habitats it occupied had moist ground with leaf-litter and ground vegetation with light intensity of 30-40%. They foraged inside the forest during summer, but in monsoon they did so more in the edges. The average size of territories was 9 ha and that of foraging area 19 ha with an average overlap of 2.5 ha. There were no differences in habitat among the pairs, except for the fourth pair which used part of the mangrove forest. They defend territories against Andaman Crow-pheasant and Andaman Shama.

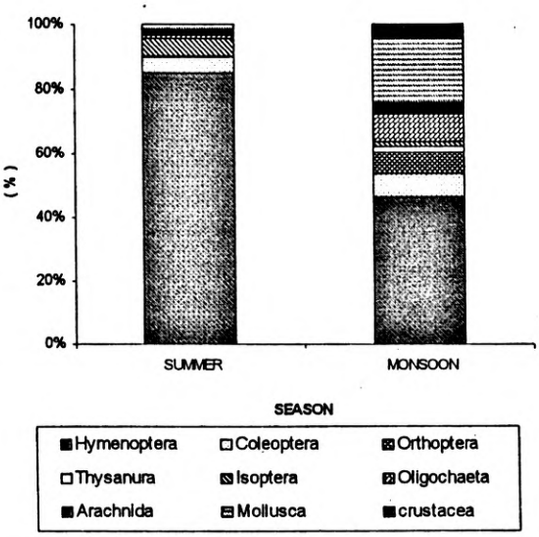
The Andaman Crake, during summer, spent most of its time (76%) in feeding followed by calls (21%), but during northeast monsoon feeding was only 68% and calls only 17%, but maintenance and agonistic activities increased. Feeding was from 0430 to 1830 hrs in summer and 05.30 to 18.00 hrs in monsoon. Calls were more during summer, that too in the morning and evening

Activity budget of the Andaman Crake



Food of the Andaman Crake was studied by direct observation and faecal analysis. Invertebrates formed an important part of the diet; it included hymenopterans, isopterans, molluscs (snails), coleopterans (beetles), oligocheates (worms), arachnids (spiders) and crustaceans (prawns). Monthly variation in invertebrates in the faeces was noted. April and May had more Hymenopterans than in August and September. Diet of Andaman Crake had more Hymenopterans (85%) and fewer Oligocheata (1%) and Mollusca (2%) during summer, while in monsoon it was 46%, 9%, and 20% respectively. Invertebrate diversity was higher in the monsoon (H¢ = 1.6498) than in summer (H¢ = 0.6395).

Food of the Andaman Crake



The Andaman Crake has a relatively unspecialized, straight bills of moderate length and depth to take a wide variety of food items, chiefly by probing, digging, shifting leaf litter and stone, stabbing at large prey, running and pecking, pecking in soft earth and mud. It was not found to drink water. Pecking, running and pecking, stabbing, shifting leaf and shifting stone occupied 24%, 22% 16%, 29% and 9% respectively of the feeding efforts. The foraging methods were significantly different between the seasons ($U = 2.000$, $p < 0.028$) with the variation in the type of food. When earthworms were recorded more than ants during monsoon, pecking was more than running and pecking. The average rate of feeding in each hour of the day showed the feeding rhythm with two major peaks (morning and afternoon) and one minor peak at noon.

4. Non-Breeding Ecology of the Pied Bushchat *Saxicola caprata.*

Principal Investigator : Lalitha Vijayan
Research student : D. Nirmala
Project period : 6months (July-Dec 2004)
Budget : Rs.9,000/-
Funding Source : SACON

Objectives

1. Study the non-breeding ecology and behaviour of the Pied Bushchat in the Anaikatty hills.
2. Assess the habitat utilization of the species.

The Pied Bushchat, common open country bird, confined mainly to grassland, has a wide range of distribution. The ecology and behaviour of the Pied Bushchat was conducted between August and October 2004, covering 210 hrs. Its food consists mainly of insects of Isoptera, Hymenoptera, Coeloptera and Orthoptera, picked up from the ground and occasionally from air by sallying. Faecal analysis also confirmed that insects were the principal food of the Pied Bushchat. Ground was the maximum used foraging perch while bushes of *Cassia auriculata and Lantana camara* were mainly used as perches for maintenance activities such as preening, sunning and roosting. The Pied Bushchat showed the typical pattern of activity of tropical birds with peaks of foraging activity in the early morning and in the late evening. It avoided high foraging during noon when the temperature was high. Foraging, although was the main behaviour, accounted for less than half of the total activity of the bird. Agnostic behaviour was less as the study was in the non-breeding season. It was associated with more or less similar sized birds.

Although the Pied Bushchat is a common and widely distributed species, information on the ecology of this species is important, as many of the common birds are on the decline.

5. Monitoring the Bird community in the Silent Valley National Park

Principal Investigator : Lalitha Vijayan
Consultant : S. N. Prasad
Research Fellow : Anoop Das
Project period : 2002-2005
Budget : Rs.6 lakhs
Funding Source : SACON/ MoEF
Collaborating institution: Kerala Forest Dept.

Silent Valley National Park (SVNP), nominee for the World Heritage site, is one of the Important Bird Areas of the country supporting most of the rare and endemic birds of the region. Although several studies have been conducted on the birds in and around SVNP, none was comprehensive covering different altitudes and habitats.

Objectives

1. Document the bird communities in different habitats in the SVNP.

2. Compile a baseline data for monitoring the bird communities and populations of a few species.

Intensive studies were carried out on bird communities in different habitats and elevation gradients with special emphasis on the foraging and breeding of select species. Six transects were laid in different habitats with an elevation range from 1000-2000 m and bird census was conducted following point count method.

One hundred and thirty species of birds were observed in SVNP during the study. Species such as the Black Bulbul and Hill Myna disappeared from the Park after breeding. The species richness and diversity were high, but fluctuated throughout the year. The number of species was lower in July, while it was higher in December-January because of the influx of winter visitors. It also showed that species richness is inversely proportional to rainfall. Although the species richness was very low in Sispara region, it had more endemic birds as well as habitat specialists such as the threatened Nilgiri Laughing Thrush.

Detailed studies on the breeding ecology of select bird species was done. Nests were searched intensively in 5 ha plots in each transect. 517 nests belonging to 30 species including seven endemics were recorded during March 2002 to May 2005. Only six species, namely Nilgiri Laughing Thrush, Nilgiri Pipit, Pied Bushchat, Oriental White-eye, Black Bulbul, White-bellied Shortwing nested at higher altitudes, Sispara (2200m). The Malabar Whistling Thrush, Indian Scimitar Babbler, Yellowbrowed Bulbul, Black Bulbul and Small Sunbird nested at 1500 m. The rest of the 25 species nested at the altitude of 1000m. Although breeding was recorded throughout the year, the maximum number of species nested in March (32) followed by April (28) and May (16). A significant decline of nesting along with rainfall was found in the SVNP (Spearman's rank correlation r^2 =0.004, P=0.01).

A comparison of the nesting habitats shows that the number of species and also the nesting density was high in the evergreen forests at a relatively lower elevations than in the broadleaved hill forests and the shola forests at higher elevations.

Although more than 50 species of plants were used for nesting, major species were *Lasianthus celiatus, Thottea siliquosa, Saprosma fragrans* , and *Agrostichytus borneensis*. As found in most of the tropical rain forests, rainfall is the main factor for the termination of breeding, except for the Malabar Whistling Thrush.

Studies on the butterfly fauna of Silent Valley National Park

One hundred and thirty six species of butterflies comprising five families were recorded. Of the 37 endemic butterflies in Western Ghats, nine were observed during the study. The number of species of butterflies listed in the Schedule I, II and IV of the Wildlife Protection Act, 1972 was seven, twelve and two respectively.

6. Status and Ecology of the Breeding Wetland Birds in the KTDC Tourist Complex, Kumarakom, Kerala

Principal Investigator	: Lalitha Vijayan
Research student	: S. Prasanth Narayanan
Project period	: 6 months (June - Dec 2004)
Budget	: Rs.9,000/-
Funding Source	: SACON

Objectives

1. Assess the present status of the breeding wetland birds in the Kumarakom Tourist Complex.
2. Find out the species of trees or plants used for nesting and other requirements by different wetland birds.
3. Evaluate the disturbance and threats on the breeding wetland birds.

Kumarakom, once part of a private estate harbouring a large heronry with more than 3000 Night Heron, is currently part of a Tourism complex of the Kerala Tourism Development Corporation. Their activiteis to expand tourism had felling effects on the heronry and also the ecology of the area; the size of the heronry has become 1/3rd of what it was earlier. The present study is to document the heronry with a view to monitor in the coming year.

Of the 11 species, population of the Little Cormorant was the highest (1318) followed by the Shag (728), Night Heron (268) and Darter (139). The Little Egret was the rarest (4).

A total of 1068 nests of 11 species were counted, of which the Little Cormorant had the maximum nests (331) followed by Darter (168)

and Shag (157). The Little Egret and Great Egret had fewer nests, 4 and 11 respectively. It was for the first time in Kerala, that nesting of the Black-headed Ibis was recorded; it had 64 nests. Maximum nests of individual species were observed on the dykes (617).

Out of the ten colonial breeding species, seven used the marshland for breeding, of which three were exclusive to marshes. Of the 20 species of plants used for nesting, one was mangrove (*Sonneratia caseolaris*); seven species of mangrove associates and the rest non-mangroves. Among the nesting trees, five species were exotics (*Annona glabra, Bambusa vulgaris, Hevea brasiliensis, Glyricidium sepium* and *Vernonia elaeagnifolia*). Three species of climbers were also seen in association with nesting trees.

Nesting association was significant between Shag and Darter (r=0.96) as well as Little Cormorant and Pond Heron (r=0.83). Nestling and juvenile counts were also made, the former was fewer in most of the species. The Little Cormorant had the highest juvenile population (407), while the Little Egret had the lowest (6). The near threatened Darter and Ibis had lower number of juveniles, 46 and 14 respectively.

The birds concentrated more in the paddy fields for feeding rather than the Kumarakom Tourist Complex and Lake during the study period. Water in three of the five paddy fields selected for the study was drained for agricultural activities. After draining the number of Little Cormorant decreased in these fields, while the egrets, herons and ibis increased. After sowing paddy, they used the canals inside the paddy fields for feeding. Intermediate and Little Egrets were very common in these fields and showed higher feeding rates (10.38 & 8.9/min). Feeding rates and patterns varied among the species; the larger birds having lower rates.

The threats and conservation issues are discussed and recommendations given for protecting and managing these breeding colonies. Regular monitoring and detailed studies on the birds of this area are suggested. Vembanad lake and adjacent areas should be declared as a separate Ramsar site, considering the feasibility and the qualifying criteria, although it is included along with the Kole wetlands.

7. Status and distribution of the hornbills in the Western Ghats

Investigators	: P. Balasubramainan, V.S. Vijayan & S.N. Prasad
Research Fellows	: N. Krishnakumar & R. Ravi
Duration	: 6 months
Budget	: Rs. 75,000/-
Funding source	: SACON R & D

Objectives

1. find out the distribution of hornbills in the Western Ghats.

2. identify the key hornbill habitats in the Western Ghats

Hornbills are primarily frugivorous hole nesting birds depend on large trees in the primary forests. Rapid deforestation and other anthropogenic activities pose threat to their survival. SACON has an ongoing project to monitor the population of hornbills in the Western Ghats.

Distribution of hornbills in two states, Kerala and Tamil Nadu was reported last year. During the current year two additional states, Karnataka and Goa were surveyed. The consolidated results are given below:

In all, 455.91 sq km was covered in 30 Protected Areas and 18 Reserve Forests. Five forest types, namely evergreen, semi-evergreen and moist deciduous and, mixed forest and, plantations were covered during the survey. 536 hornbills of four species were sighted. The percentage of sightings of the Malabar Grey Honrbill was maximum (77.80%) followed by Malabar Pied Hornbill (12.31%). The Great Hornbill (7.5%) and Indian Grey Hornbill (2.4%) were relatively low. Hornbill sightings were maximum in the evergreen forests (42.91%) followed by semi-evergreen forests (27.05%). Most of the sightings of the Great Hornbill were

restricted to evergreen forests; Malabar Pied to low-land riparian habitats, Indian Grey to dry deciduous forests and the Malabar Grey to evergreen and semi-evergreen forests.

Majority of the Great Hornbills were sighted in southern Kerala and Tamil Nadu. Major locations include Indira Gandhi Wildlife Sanctuary, Periyar Tiger Reserve, Agasthiamalai Biosphere Reserve and Vazhachal Reserve Forest. Majority of the Malabar Pied Hornbill were sighted in northern Karnataka and Goa. Important locations include Dandeli Wildlife Sanctuary, Someshwara Wildlilfe Sanctuary and Molem National Park. While majority of the Indian Grey Hornbill sightings was from Shetty Hally and Badra Wildlife Sanctuaries of Karnataka, the Malabar Grey Hornbill was sighted in most of the sites surveyed in the Western Ghats.

8. Status and distribution of the hornbills in the Eastern Ghats

Investigators	: P. Balasubramainan, V.S. Vijayan & S.N. Prasad
Research Fellows	: R. Venkitachalam
Duration	: 5 months
Budget	: Rs. 70,000/-
Funding source	: SACON R & D

Objectives

1. Assess the status and distribution of the hornbills in the Eastern Ghats.

2. Evaluate the threats to the population and habitats of the hornbills.

This study documented the distributional status of hornbills in the Eastern Ghats. The survey was conducted in the Eastern Ghats complex of Tamil Nadu and Andhra Pradesh. In Tamil Nadu, twelve forest divisions and in Andhra Pradesh, eight protected areas (6 Sanctuaries, and one each of a National Park and Tiger Reserve) were surveyed. Hornbills were censused following Line Transect method. Potential breeding sites of hornbills were identified and their threats assessed.

Two species, namely Indian Grey Hornbill and Malabar Pied Hornbill were recorded in the Eastern Ghats. Of the 75 hornbills recorded, 97% was Indian Grey Hornbill and the remaining Malabar Pied Hornbill. Hornbills were sighted from semi-evergreen, dry deciduous and thorn forests. Maximum sightings (68%) of the Indian Grey hornbills were from the dry deciduous forests. The Malabar Pied Hornbill was sighted in riparian habitat. Maximum sightings (89%) of Indian Grey Hornbill were from Andhra Pradesh. Nagarjunasagar Srisailam Tiger Reserve, Sri Venkateswara National Park, Kinnersani Wildlife Sanctuary and Gundlabrameswaram Wildlife Sanctuary are the major hornbill locations in Andhra Pradesh. In Tamil Nadu, the Indian Grey Hornbill was recorded in Hogenakkal, Sathyamangalam and Thengumarahada. Major disturbances to hornbills include fire, agricultural activities and poaching.

9. Ecology and habitat utilization by the Indian Peafowl, *Pavo cristatus* in Anaikatty hills, Western Ghats

Investigator	: P. Balasubramanian
Student	: N. Rajesh Kumar (M.Sc. student project)
Budget	: Rs. 6,000/-
Period	: December 2004 - March 2005
Funding source:	SACON R & D

Objective

1. The status, activity pattern, feeding and roosting and habitat utilization of Peafowl in the Anaikatty hills.

A study on the ecology and habitat utilization of the Common Indian Peafowl was conducted between December 2004 and February 2005 in Anaikatty hills, Western Ghats as part of the long-term monitoring of the ecology of the area. Direct observations were carried out to determine the population, food and feeding habits, roosting behaviour and roosting trees of peafowl.

Routine bird count in roosting areas showed 21 peafowl in and around SACON's campus. Out of this, 17 were male and the remaining females.

In Anaikatty hills, a total of 16 trees belonging to four species were used for roosting. Among the four species, *Acacia polycantha* was used the maximum. The preferred roost height was between 10 and 13 meters. Most of the roost trees were located near streams which were dry.

Among the various habitats available in Anaikatty hills, scrub jungles were used maximum followed by cultivated lands. Open barren lands and dry deciduous forests were also used, but to a lesser extent. Dogs cause high level of disturbance followed by cattle.

The peafowl is opportunistic and omnivorous. The vegetable matter comprised shoots, seeds, fruits and flowers, while animal matter insects and earthworms. Dropping analysis revealed a high proportion of vegetable matter in the diet. Among the fruits consumed, *Zizyphus oenoplia* formed the maximum.

10. Identification and mapping of Lesser Florican breeding sites to develop a fodder producing grassland network in western India

Investigator	: R Sankaran
Duration	: 3 years; 2004-2007
Commencement	: February 2004
Budget	: Rs.7,86,025/-
Funding agency	: MoEF, Govt. of India

The Lesser Florican, *Sypheotides indica*, a critically endangered species, breeds only in the grasslands of Western India. Protection of these grasslands, locally known as *vidis* or *beeds* is the prerequisite for saving this bird from extinction. SACON has a long-term conservation programme for Lesser Florican since 1993.

Objectives

i) Identifying new grassland sites where significant populations of the Lesser Florican breed, so as to develop a comprehensive conservation area net work for this species and other grassland dependent species.

(ii) Defining the boundaries of grassland clusters where the Lesser Florican breeds to develop pragmatic and well-defined sites for this species and other grassland dependent species.

(iii) Advocate the management and restoration of grasslands for people and the Lesser Florican.

As part of the ongoing conservation programme on the Lesser Florican and its grassland habitat known as *vidis* or *beeds*, a survey to establish the population status of the species is done every fifth year. As the previous one was done in 1999, it was intended that a survey would be done in 2004. However, the rains were erratic. While the onset was on time and copious, there was a subsequent dry spell for over a month with the raiins commencing only after August 10th. The response of the Lesser Florican to such rainfall patterns is delayed and/or breeding failures and a scattering of birds in the region thus precluding an effective survey of the area to assess populations.

A brief visit was made to Gujarat where the process of transferring land to the Forest Department at Nalliya, Kachch, was rejuvenated. Grassland sites were revisited in Junagadh and Rajkot and new sites were visited at Amreli and mapped, As expected, due to the erratic monsoon, very few floricans had settled to breed.

Mapping aspect of the study could not be initiated for some technical reasons.

11. Avifaunal diversity of the Andaman Islands and their conservation

Investigator	: Lalitha Vijayan
Consultant	: S N Prasad
Research Fellows	: M A Rajamamannan & Priti Kaushik
Duration	: 2 years (2003-2005)
Budget	: 8.5 lakhs
Funding agency	: Dept. of Biotechnology, Ministry of Science & Technology.

Objectives

1. Assess the avifaunal diversity and status of the endemic birds in different islands in Andamans.

2. Help plan, conservation and development strategies for the islands.

The fragile ecosystem of the Andaman islands, although disturbed at many places, because of the various anthropogenic activities, supports a large number of endemic species. The present study started in 2003-2004, focuses on the diversity, status and distribution of the avian species.

Surveys were conducted in 43 islands in the Andaman group of islands, including 31 sanctuaries, two National Parks and five Tribal Reserve Protected Areas. Bird counts were made following unlimited distance point count method at 1615 points in 254 localities (Little Andaman 33, South Andaman -116, Middle Andaman -29, North Andaman -76) covering 447.37 ha (Little Andaman 79.65, South Andaman -225.15, Middle Andaman -24.66, North Andaman -117.91) which included forests such as tropical evergreen, semi-evergreen, moist deciduous, deciduous, littoral and mangrove and, plantations and other disturbed areas.

One hundred and sixty bird species with variation of 5 - 45 species at different sites were recorded, including all the 53 endemic birds, except the Narcondam Hornbill *Rhyticeros (Aceros) narcondami* reported till date. In Little Andaman (LA) 97 spp including 8 endemics, South Andaman (SA) 127 spp including 11 endemics, in Middle Andaman (MA) 80 spp including 9 endemics and in North Andaman (NA) 111 spp including 11 endemics were recorded. Three species were recorded for the first time in the Andaman Islands, namely the Grey-headed Canary Flycatcher, Tickell's Blue Flycatcher and Blue-fronted Robin. The Andaman Crake, which is a Data Deficient species was observed in 14 locations. The Andaman Teal was observed in 11 locations in large flocks, especially in the Jarawa Reserve in South Andaman.

Habitat-wise analyses showed maximum bird species richness in the littoral forest (108) followed by moist deciduous, semi-evergreen and evergreen while species diversity was high in mangrove (H' 3.68) followed by the same pattern, as that of species richness. Data for different island groups showed some variation from the total picture; NA had the highest diversity in mangrove, MA in littoral, SA in littoral with mangrove and LA in semi-evergreen forest. The endemic species were more in the semi-evergreen followed by evergreen and moist deciduous. Grasslands and sandy/ rocky shores had the minimum diversity. Reduction in the diversity in human habitations and forest clearings was discernible.

From the satellite data habitats were classified and quantitative estimates for the relevant tentative thematic classes obtained. Ground checking was done in select habitats in SA, MA and NA for comparison with the image and categorization of the sites for supervised classification. Supplementary non-remote sensing data for interpretive model analysis and for integration into GIS were acquired. Land use changes were recorded based on information such as local activities and settlement history.

While comparing and checking land use classes with ground control points, intermixing was observed in the digitally classified preliminary output. In order to alleviate blended classes, visual interpretation has been done for NA as a sample by using field data and general

interpretation key and, further classification was done. The extent of habitats showed moist deciduous forest as the most dominant (42%) followed by semi-evergreen (17%), mangrove (16%) and evergreen forests (13%), while other habitats such as agriculture (6%), sandy shores and mudflats (3%) and littoral forests occupied a smaller extent. Similar analyses are being done for other regions.

Association of the bird communities and endemic species with their respective habitats has been delineated and point database has been generated and incorporated with land use / land cover map. Based on habitat suitability and resource availability critical conservation areas will be identified.

12. In-situ & Ex-situ conservation of the Edible-nest Swiftlet *Collocalia fuciphaga* in the Andaman & Nicobar Islands

Investigator	: R Sankaran
Research Fellow	: Shirish Manchi
In Collaboration	: Department of Environment and Forests, Andaman & Nicobar Islands
Duration	: December 2002 - March 2005
Budget	: Rs 10 lacs
Source of funds	: Department of Environment and Forests, Andaman & Nicobar

Objectives

In-situ conservation

1. To establish protection camps so as to ensure successful breeding of Edible-nest Swiftlets at defendable sites.
2. To study the breeding chronology of the Edible-nest Swiftlet.
3. To study longevity and dispersal patterns of the Edible-nest Swiftlet.

Ex-situ conservation

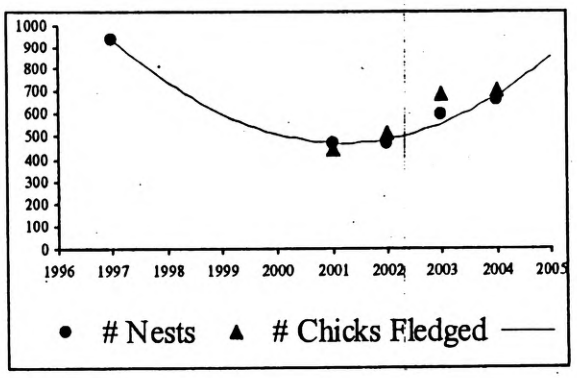
1. To identify man-made structures where White-bellied Swiftlet breed currently.
2. To develop the technology to construct low cost structures and the methodology to attract and induce White-bellied Swiftlet to breed in them.
3. To establish new population of Edible-nest Swiftlet in these man made structures by way of introducing the eggs of the Edible-nest Swiftlet into the nests of White-bellied Swiftlet nesting in these structures.

On de-listing of the Edible-nest Swiflet from the Schedules of the WPA, 1972

1. Establish marketing and processing systems to develop income generating systems.

The programme, 'in-situ & ex-situ conservation of the Edible-nest Swiftlet *Collocalia fuciphaga*, has been under way since 1999 in the Andaman & Nicobar Islands. It has the twin objectives of developing and implementing a conservation programme that makes local communities responsible for the conservation of swiftlets while drawing economic benefits from such conservation action, as well as to understand the ecology and the behaviour of the species.

Considerable progress has been made in the year under report. The research scholar, who had joined the project at the end of the 2003 season, had through the 2004 season undertaken intensive observations on three major aspects, namely the breeding biology, foraging ecology and nesting habitat requirements of the species. The data are being analysed.



The population of the Edible-nest Swiftlet continues to grow at our study site at Chalis Ek, Pathi Level, North Andaman Island, where the current population is over 600 pairs. The population at Interview Island has, however, continued to stagnate at about 150 pairs, and this has been due to owls *Ninox affinis* and *N.*

scutulata and possibly *Otus balli* having learnt to prey on swiftlets within the caves. Over 1000 chicks fledged successfully.

Ninety-six adult swiftlet and 229 chicks were ringed towards the end of the breeding season. Of the 66 recaptures, two were of birds from 2001, six from 2002, and 11 from 2003. In the previous years, when ringing was done at the commencement of the breeding season, none of the chicks ringed in previous years were trapped. While in 2004 when ringing was done in August, 11 chicks that fledged in 2003 were recaptured thus indicating that the chicks fledged the previous year return to the cave sometime between January and August of the next year.

Under ex-situ conservation, over 50 eggs were transferred to the nests of Whitebellied swiftlet in the house at Tugapur to be incubated and foster cared by the Whitebellied Swiftlet.

The problem of the Edible-nest Swiftlet remaining in Schedule I of the Wildlife Protection Act continues to be a hindrance to the ex-situ conservation programme. In the meeting of the Standing Committee of the Indian Board for Wildlife in August 2004, no decision was taken and a fresh proposal was required to be sent to the MoEF. This has been taken up with the Department of Environment and Forests, A & N Islands.

The swiftlet camps have been set up at Chalis Ek and at Interview island on the 7th and 12th of January respectively. Damage due to the earthquake has been minimal at the cave on Interview Island; the land however has risen making the approach to the Island a little difficult as the boat is unable to reach as close to the shore as was earlier possible. At Chalis Ek, there has been considerable damage and an assessment is underway.

Field research continued till the end of the period under report with a focus on breeding and foraging ecology of the species.

13. A rapid assessment of the impact of the earthquake and the *tsunami* on the Nicobar Megapode and other endemic avifauna of the Nicobar Islands

Investigator	: R Sankaran
Duration	: 4 months
Commencement	: March 2004
Budget	: 1,17,500/-
Funding agency	: Wildlife Trust of India

Objectives

1. Assess the impact of the tsunami on the habitats of the Nicobar Megapode in the Nicobar Islands, and to assess impacts on other endemic species of birds.

2. To provide ecological inputs to the process of settlement and rehabilitation of people affected by the *tsunami*.

The Nicobar Megapode, is a mound nesting bird endemic to the Nicobar Islands. Between 1992 and 1999, we have surveyed the Nicobar Islands extensively circumventing the islands on foot and by boat for estimating its status. We also had a field station at the southern tip of Great Nicobar to study the ecology of the Nicobar Megapode.

The earthquake and *tsunami* on the 26 December 2004 has seriously affected the coastal areas of the Nicobar Islands by both washing off the coastal forests as well as submerging considerable coastal areas, resulting in significant geographic changes in the islands. Thus all life forms inhabiting coastal habitats, and particularly those exclusively inhabited it, would have been seriously affected. Of all terrestrial species, the Nicobar Megapode would have been particularly affected as the species primarily and on some islands, exclusively, inhabited coastal forests.

A rapid assessment of the Nicobar Megapode habitats would be of immense value to understand the impact of earthquake and the *tsunami* on coastal forests, which would prove critical to formulate rehabilitation programme

for both the indigenous people and mainland settlers that must necessarily follow.

A rapid survey of the Nicobar Islands was commenced in March 2004. The survey is ongoing.

14. Database on Indian Ornithology

Investigators	: Lalitha Vijayan & V.S. Vijayan
Consultant	: P. Sastry
Budget	: Rs. 1 lakh/ year
Funding source	: SACON R&D

Objective

- Develop a comprehensive user-friendly database on Indian Ornithology.

The project to create a database on Indian ornithology was initiated in 2002 with 100 characters. It was found inadequate to cover various minute details on the taxonomy, status, ecology & behaviour of individual species. Subsequently several revisions have been made and during 2004-2005, 550 fields have been created with seven major fields, namely name, colour, features, status, habits, nesting and social behaviour. Each field consists of sub fields and sections.

Data are being entered accordingly and tested. Refining of queries and generation of museum fields have to be done.

II. MAN AND BIODIVERSITY CONSERVATION

Man has been living in harmony with nature since time immemorial. This harmony has been disrupted since human population started increasing and the demand on biological resources became manifold. Gradually the relationship between Man and nature became a destructive proposition leading to habitat loss (estimated at 0.6% per year in the tropics) and fragmentation, over harvesting of wild populations, chemical pollution, introduction of species and, lately, climatic changes; all posing threats to the biodiversity and thus, to the very survival of Man. It is in this context that the Convention of Biological Diversity made it mandatory for all countries to make a systematic assessment of the impacts of these threats on ecosystems and species in order to prioritize them for conservation action. It has thus become a major area of research interest of SACON.

Under this thrust area, we focused on environmental contamination and habitat alterations on biodiversity and also projects related to conservation issues.

a) Environmental contamination and biodiversity

15. Monitoring of Environmental Contaminants in Indian Avifauna

Project Investigator	: S. Muralidharan
Project Personnel	: V. Dhananjayan
Annual budget	: Rs. 1,28,000/-
Duration	: Long-term
Funding Agency	: SACON R & D

Objective

- Long-term monitoring of the pesticides and heavy metals in the Indian Avifauna.

Our sustained efforts to monitor contaminants in birds received continued support and encouragement from various quarters. During this year we received 218 dead birds comprising 36 species. Mr Rahul Sehal of Animal Health Foundation (AHF), Ahmedabad gave us excellent support in collecting 130 birds belonging to 17 species which were the victims of kite flying in and around Ahmedabad during January, 2005. While the AHF saved hundreds of birds, we took possession of the unfortunate ones. Barn Owl, Banded Crake, White-backed Vulture, Pariah Kite, Black Ibis, White Ibis and Openbilled Stork are a notable few. 70 Blood samples from 10 species of birds were also collected at the animal treatment centre, Ahmedabad and samples were stored at - 80°C for organic pollutant analysis and enzyme study.

The House Sparrow, Peafowl, Shikra, Sooty Tern and, Common Indian Nightjar were the

other notable species of birds we received at the lab. Further, 26 unsuccessful eggs comprising seven species (Redvented Bulbul, Redwhiskered Bulbul, Common Coot, Pied Bushchat, Indian Robin, Purple Sunbird and Little Brown Dove) were also analyzed for organic contaminants.

While our efforts to document the residue levels are continued, preliminary analysis shows that no bird is free from the residues of many persistent pesticides. A set of birds such as Asian Koel, Common Myna and Common Bush Quail received from an agricultural area near Coimbatore city had HCH, heptachlor epoxide, total DDT, total endosulfan, dieldrin and Chlorpyrifos in 100, 98, 92, 85, 45 and 26 per cent of the tissues analyzed respectively. Although the levels were not indicative of poisoning, their continued presence in the environment is of great concern. Chlorphyrifos, an organophosperous chemical which is expected not to remain in the environment for long was also detected in all the tissues of Asian Koel including the undigested food material found in the crop.

Dieldrin poisoning was evident in Shikra received from the outskirts of Coimbatore. Liver and brain tissues had 24.8 and 8.78ppm of dieldrin respectively, which is indicative of poisoning. Similarly high levels of *p,p'*-DDE were detected in liver (10.59 ppm), muscle (8.78 ppm) and brain (1.01ppm) tissues of House Crow collected from Coimbatore.

Samples have been processed for many inorganic contaminants, and are expected to be analyzed soon.

16. Organic contaminants in the marine fishes available in Coimbatore and their suitability for human consumption

Project Investigator	: S. Muralidharan
Project Personnel	: A. Alaguraj
Duration	: Two years
Commencement	: October 2004
Budget	: 1.40 lakhs/year
Funding agency	: SACON R & D

Objectives

1. Document the levels of pesticides in the commercial fishes sold in Coimbatore market.

2. Asses their suitability for human consumption.

Our recent study on the inorganic contaminants (heavy metals) in the marine fishes available in Coimbatore prompted us to expand our investigations to organic contaminants with special reference to organochlorine pesticides, PCBs and their congeners. As the organic contaminants are known for their persistence and bioaccumulative properties through the food chain, quantification of the same in the fishes could be a surrogate measure to evaluate the probable ill effects on humans. Seasonal collection of the fish samples from the Coimbatore market which receives fish from two locations, namely Cochin and Rameshwaram was carried out from October 2004. Totally 620 individuals comprising 16 species have been collected. It is expected that the current study besides documenting the variation in the magnitude of organic contamination and generating a database, will also be able to advise the public on the suitability for consumption.

17. Assessment of the reproductive health outcomes (adverse health) among women working in plantation sector

Investigator	:	Dr R Sukanya, Community Medicine, Chennai
Collaborator	:	S Muralidharan, SACON
Research Personnel	:	V Dhananjayan and P Jayanthi
Duration	:	6 months (March - August 2005)
Funding source	:	MacArthur Foundation, Delhi
Budget	:	2.00 lakhs

A total of 369 samples were received in two batches. Processing and analysis of all the samples have been completed. Invariably, all the samples contained organochlorine residues especially DDE and aldrin at high levels.

Confirmatory tests for aldrin with GC-MS are being organized. 50 % of the results were compiled and sent to the funding agency. Compilation of the remaining 50 % of the data is in progress. The work is expected to be completed by September 2005.

b) Conservation

18. *Sthalavriksha* practice in conservation of plant biodiversity in Tamil Nadu

Investigator	: P. Balasubramanian
Research student	: M. Gunasekaran
Duration	: 4 years
Commencement	: November 2001
Funding source	: Self (by the student)

Objectives

1. Conduct taxonomic survey of sthalavrikshas and bring out an authentic list of sthalavrikshas in Tamil Nadu.

2. Document the religious background and cultural practices associated with sthalavrikshas.

3. Assess the ecological importance and conservation values of sthalavrikshas.

Sthalavrikshas are plants venerated as holy as the prime deity of the temple from time immemorial, by the devotees of ancient Tamil culture. This age-old practice plays a vital role in conservation of certain native plant species. Hence, the present project was initiated in 2003.

Based on a thorough review of the literature, temples were selected and surveyed to document *sthalavriksha* species and the cultural practices and religious faiths associated with this worship. Collection of data from the temples was made by using a specially designed questionnaire. Sample specimens were collected for identification and herbarium prepared.

In the current year, of the 144 temples surveyed, *sthalavrikshas* were found in 131 temples. A total of 36 species belonging to 23 families including 34 dicots (21 families) and two monocots (2 families) were recorded. Most common sthalavriksha species is *Aegle marmelos*, (Rutaceae) found in 52 temples followed by *Prosopis spicigera* (Mimosaceae) in 17 temples. In some temples, *sthalavrikshas* are dead, but the dry wood is still worshipped eg. *Stereospermum chelonoides* in Avinashi temple at Coimbatore district.

In some temples, the dead plant was replaced with one of the most common sacred plants, *Aegle marmelos*. Majority (94%) of the Sthalavriksha" species are trees. Religious values and cultural practices associated with several species of *sthalavrikshas* were gathered.

From the ecological point of view, *sthalavrikshas* provide food, shelter and nesting substrates for several birds and squirrels. Survey is underway to cover the remaining temples in the state.

19. Tracing the migration of Indian marine turtles: towards an integrated and collaborative conservation programme

Principal Investigator	: S. Bhupathy
Research Fellow	: M. Vijay
Duration	: Initially One year; extended up to March 2005
Date of initiation	: December 2003
Funding source	: Madras Crocodile Bank Trust
Budget	: US$ 5000/-

Objectives

1. monitor important nesting sites in Tamil Nadu and Kerala to assess the conservation status of different species of marine turtles,

2. To network with and provide training to government officers and non-government organizations in both states to enhance conservation actions.

The project was completed and the Final Report submitted to the Funding agency (Madras Crocodile Bank Trust, Chennai).

Major findings are given below:

1. The important sea turtle nesting areas were found in north Kerala and Tamil Nadu coasts.

2. Nesting occurred during October-December along the west coast, whereas it was during April-July in the east coast.

3. Nesting density along the east coast was 7-15 nest/ km, while it was about 3/km in the east coast.

4. Turtle mortality was largely due to incidental catch in the fishing gears. Nest pilferage by humans was observed along the Nagapatinam coast, whereas it was low along the Chennai and north Kerala beaches, as NGOs with community participation were involved in protecting the nests.

5. Major suggestions for turtle conservation include, closed season for fishing using gillnets, enhanced beach patrolling and community participation.

20. Status of Reptiles in Eravikulam National Park

Principal Investigator	: S. Bhupathy
Research Fellow	: A. M. A. Nixon
Duration	: Ten months
Date of initiation	: August 2003
Budget	: Rs. 70,000/-
Funding Source	: SACON R&D Funds

Objectives

1. Determine the reptile species diversity and abundance in Eravikulam National Park.

2. Compare the reptile community of the montane shola and grasslands of the Eravikulam National Park with Mukurthi National Park.

A rapid assessment of the status of reptiles was conducted in Eravikulam National Park (ENP) from December 2003 to March 2004. Visual encounter and quadrat sampling were used for data collection. In all, 3.125 ha. including 0.725 ha. in shola and 2.5 ha. in grasslands were sampled using quadrates. In addition, 60 hrs of visual encounter surveys in the former and 36 hrs in the latter were done. Eight species of reptiles including three lizards and five snakes were recorded. Taxa composition at generic level and abundance of the reptiles of Eravikulam National Park was similar to that of Mukurthi National Park. All species except one was endemic to the Western Ghats. Preliminary analysis of niche utilization shows that all reptiles in Eravikulam National Park had low niche breadth values indicating their specialist nature in resource use. Further analysis and report preparation are in progress.

III. ECOSYSTEM STUDIES

It is increasingly evident that a proper understanding of the patterns and processes that govern the ecosystem is vital for formulating long-term conservation programmes. Realizing the difficulties to have large manpower and huge financial commitment for total ecosystem studies, it has been decided to concentrate on key issues in minute details, which would provide a reasonable understanding of the system.

SACON campus which is a degraded deciduous forest and which has been offered partial protection from grazing has been taken up for a long-term study of terrestrial system while Keoladeo National has been taken up for wetland ecosystem. Teesta river basin in Sikkim has been taken up for studying some of the key elements of the ecosystem.

21. Biodiversity monitoring of Anaikatty Reserve Forest - a long-term study on the ecology of a dry mixed deciduous forest

Principal Investigator	: V.S. Vijayan
Co-investigator	: Lalitha Vijayan, S.N. Prasad, S. Bhupathy and P. Pramod
Research Fellows	: R. Eswaran, Debanik Mukherjee, K. Anitha, R. Dhanya, J. Ranjini
Duration	: Long term
Budget	: Rs. 8 lakhs/yr.
Funding source	: SACON R&D

Birds

The bird community of the Anaikatty forests were monitored following variable-width line transect method using five transects of one km each. Seasonal surveys were also carried out. Nesting and other ecological aspects of the select species, namely Whiteheaded Babbler, Indian Robin and House Sparrow were also studied.

Apart from the above, extensive surveys were carried out in the surrounding hills covering habitats such as evergreen patches on the hill tops and rocky slopes. Several species such as Grey-headed Canary Flycatcher, Indian Blue Robin, Large-billed Leaf Warbler, Dusky Crag Martin, Alpine Swift, Blyth's Reed Warbler, Greenish Leaf Warbler, Booted Warbler and, Green Sand Piper were recorded.

One hundred forty three species of birds were recorded from the study area during 2004-2005. Their abundance was high during northeast monsoon and also in winter, but low during southwest monsoon. The main winter visitors were Lesser Whitethroat, Dull Green Leaf Warbler, Blyth's Reed-warbler, Greenish Leaf Warbler and, Brown Shrike. This was followed by the flocks of altitudinal migrants such as Black Bulbul, Grey-headed Myna and Blossom-headed Parakeet, and a few locally moving Ashy Drongo and Verditer Flycatcher, and the resident birds such as Red-whiskered Bulbul, Purple Sunbird, Loten's Sunbird and Paradise Flycatcher which breed here during north-east monsoon. 335 nests of 28 species were observed this year. The dominant species nested were Redvented Bulbul (122), Indian Robin (56) and Whiteheaded Babbler (51).

Whiteheaded Babbler and Indian Robin

Twenty-Six flocks of Whiteheaded Babbler and 32 pairs of Indian Robin were observed in the SACON campus.

Foraging: The Whiteheaded Babbler and Indian Robin used mostly ground gleaning for feeding. While the feeding substratum of the former varied from trees (bark), bushes, ground and walls, the latter strictly fed from the ground, though it sometimes reached up to the posts to take ants. The food of the Whiteheaded Babbler include ants, caterpillars, moths, grasshoppers, Annelid worms, fruits, and cooked items. The cooked rice and bakery items were picked up from the surroundings of the hostel. The Indian Robin fed on such items as ants, caterpillars and worms.

Territory: The Whiteheaded Babbler maintains group territory; territorial fights are common. During fight, the members of each group clump together and display threat signals face to face. Group splitting and joining and formation of new groups were observed.

Indian Robin is a highly territorial bird, and it maintains its territory year-long, even though there is some overlap between pairs during the non-breeding season.

Breeding: 51 nests of the Whiteheaded Babbler and 56 nests of the Indian Robin were observed during the year. The former nested throughout the year except during February and July, while the latter started nest building during February and continued till July. A maximum of three broods and five re-nesting attempts were observed in the Indian Robin. The clutch size varied from 1 to 3.

House Sparrow

The decline of House Sparrow, a once ubiquitous species, is in an alarming rate the world over. The present study aims to reveal the extent of urbanization and its aftermaths on the same. Studies were conducted within the campus and also in some select villages and urban areas in Coimbatore.

Fourteen pairs of sparrows were counted inside the SACON campus during the year. Five pairs had their nest on the ventilators of the buildings. Among the experimentally introduced boxes, three of the bamboo nests were active and of the recently introduced mud pots four were filled with nest material. Wooden boxes were not used.

Observations in the Coimbatore city and suburban areas show that a) the number of birds and nests was more in the village (337 sparrows and 109 nests) followed by suburban (228 sparrows and 24 nests) and urban areas (161 sparrows and 19 nests), b) sparrow population had a positive correlation with *Prosopis juliflora* and also with the open drainages, and c) in the suburban areas sparrows nest mostly in the old or cubicle of abandoned houses.

Insects

The monthly insect sampling following various methods such as pitfall, sweeping, beating sheet and light trap was continued for the year 2004-2005. The important results and findings are given below.

Pitfall contributed 63% of the insects sampled which was followed by light trap (16%), sweeping (11%) and beating sheet (10%). These insects belong to 14 different orders. Insects belonging to nine orders were recorded in all the methods, while those from three orders were captured only in pitfall and, one order each was represented only in beating sheet and sweeping method. Catch variation in different methods shows the habitat range of the particular insects.

Hymenoptera was the most abundant insect order in the sampling followed by Coleoptera, Hemiptera, Orthoptera and Diptera. The Neuroptera was the least abundant. Hymenoptera dominated in pitfall sampling, while, Orthoptera did so in sweeping method. Coleoptera was abundant in beating sheet and light trap methods. These results indicate the efficacy of particular method for selected group of insects as well as the diversity of insects in particular microhabitat. Seasonality of the insect orders varied; the ground insects showed an exactly opposite trend of seasonal abundance with those insects found on vegetation. Size class of the insects collected in all the methods showed unimodal distribution with a peak in 2-4 mm size class. The detailed analysis of the biotic and abiotic interactions of the insects community is in progress.

Butterflies

The monthly sampling of butterflies was continued using the Pollard transect walk method from the four permanent transects laid in the study area. The butterfly diversity pattern in different months of the year had a bimodal pattern with a major peak in the post monsoon and sub-peak in the pre-monsoon. Monthly mean temperature, humidity and light intensity did not show any direct correlation with butterfly activity. But the butterfly population followed the rainfall pattern though not correlated with it. Rains in October offers a more congenial environment for the butterflies in November resulting in sudden high peak of population along with high migration and heavy mud-puddling behaviour of butterflies in this region.

Pieridae was abundant in mud-puddling, followed by Papilionidae. The Common Gull (*Cepora nerissa* Fab.) was the most abundant butterfly in mud-puddling. Common Mormon (*Papilio polytes* Linn.), Common Emigrant (*Catopsilia pomona* Fab.), Yellow Orange Tip (*Ixias pyrene* Linn.) and Lime (*Papilio demoleus* Linn.) were the other common butterflies of the mud-puddling aggregations in Anaikatty hills. The pattern of abundance of mud-puddling butterflies showed a similar trend with that of the total butterfly community studied through the Pollard transect walk method. Species interactions of butterflies in the mud-puddling behaviour is being analysed.

Migration of butterflies: The Dark Blue Tiger (*Tirumala septentrionis* Butler), Blue Tiger (*Tirumala limniace* Cramer), Common Crow (*Euploea core* Cramer), Double Branded Crow (*Euploea sylvester* Fab.) and Common Emigrant (*Catopsilia Pomona* Fab.) migrate through the Anaikatty hills. Migration was more in April to May and October to December and it was from Southeast to Northwest direction except in July 2004, when migration occurred in opposite direction i.e., from Northeast to Southwest. The areas of aggregation of butterflies in and around Anaikatty hills were also recorded and the detailed analysis is in progress. The migratory path of the butterflies was also marked.

Anaikatty harbours nine endemic species of butterflies. Three are included in Schedule I, seven in Schedule II, and one in Schedule IV of the Wildlife Protection Act, 1972.

Herpetofauana

The major objectives of the herpetofaunal component of the Anaikatty ecosystem monitoring project are to (1) determine the distribution and abundance of herpetofauna in Anaikatty hills and (2) study the ecology of select species of herpetofauna. Methods such as transect, quadrat, visual encounter, road cruising, cover board and pitfall were used for sampling as in the previous year.

Including opportunistic observations, a total of 61 species of herpetofauna including 55 species of reptiles and six species of amphibians were observed during the year. Analysis of the pattern of species accumulation shows a steady increase of species. Snakes and geckoes contributed about 89% of the herpetofaunal community of the area. Spatially, 68% of the reptiles occupied terrestrial, 24% arboreal, 6% subterranean and, 4% aquatic habitats. Temporally, about 45% of reptile species were nocturnal, 46% diurnal and 9% were seen both day and night. Microhabitat use of the herpetofauna was clumped into six categories, namely foliage, rocks and boulders, termite mound, ground, building walls and puddles. Arboreal snakes, agamid lizards and geckoes largely used foliage. Day geckoes, rock agama and lacertids occupied rocks and boulders. All amphibians and many species of reptiles were highly seasonal. For instance, *Uropeltis ellioti* was observed only during rainy season (October - December). Detailed analyses on spatio-temporal resource use of the herpetofauna, especially reptiles are in progress.

Plant community

Study to investigate the plant community structure of Anaikatty Reserve Forest was continued. Reconnaissance survey of the study area was done using the satellite imagery and Survey of India maps. Different habitats along disturbance gradients were identified. Quadrat method was used for sampling the vegetation. Data were analysed to obtain quantitative structure and composition of tree communities.

Thirty-eight species (33 genera), 22 species (33 genera) and 23 species (19 genera) were identified in the undisturbed, moderately disturbed and highly disturbed forest stands respectively. The plant community showed a change in the structure from *Albizia amara - Cordia monoica - Canthium dicoccum* to *Pleiospermium alatum - Ehretia ovalifolia - Maba buxifolia* to *Chloroxylon swietenia - Prosopis juliflora - Albizia amara.* Plant species were comparatively higher in undisturbed forest than in the other two sites, which could be related to habitat degradation. Open space created by cattle grazing, collection of branches and leaves for livestock and firewood, and illicit felling of trees were observed in disturbed sites.

Regeneration was affected badly in all the three sites. The principal tree species in all the three sites had fewer saplings and seedlings. In the undisturbed site, *Memecylon sp, Acacia canescens, Atalantia racemosa* showed good regeneration. In the moderately disturbed site *Ehertia ovalifolia, Acacia canescens, Pleiospermium alatum* had higher adult-seedling ratio, whereas in the highly disturbed sites regeneration was high for *Acacia arabica, Ehertia ovalifolia* and *Acacia leucopholea.*

A total of 216 plant species were identified from Anaikatty Reserve Forest. Of these seven, namely *Stenosiphonium cordifolium, Litsea laevigata ,Litsea ligustrina,*

Maytenus heyneana, Capparis grandiflora, Manilkara roxburghiana and *Strobilanthes kunthianus* were endemics. *Stenosiphonium cordifolium* and *Strobilanthes kunthianus* are known for their plietesial flowering cycle. In November, mast flowering of a small population of *Strobilanthes kunthianus* in Perumal Mudi and neighboring areas and that of *Stenosiphonium cordifolium* in and around Vellaparai were noticed. Selected populations of both the species were marked to distinguish flowered and non-flowered populations.

The satellite data of IRS-P6 LISS III for February 2005 was acquired. Interpretation of imageries is being done.

22. Monitoring of Keoladeo National Park Ecosystem

Principal Investigators	: V S Vijayan, Lalitha Vijayan, P A Azeez, S. Muralidharan, S. Bhupathy & S N Prasad.
Research Fellows	: Amlan Dutta, B. Anjan Kumar Prusty & M. Sudheer
Project period	: 2003-2006
Budget	: Rs.7.44 lakhs
Funding Source	: SACON/MoEF

The Keoladeo National Park, Bharatpur is the only National Park in India where a detailed study on the ecosystem was conducted. The salient features of the ecosystem and the management issues were identified during the study conducted from 1981 to1991. Drastic changes have occurred in the area during the last decade; the aquatic area is being colonized by woodland species and population of the waterfowl declined discernibly. Therefore, it was decided to undertake a long-term monitoring of this World Heritage Site.

Objectives

1. Monitor the key factors affecting the ecology.
2. Monitor the succession of vegetation.
3. Monitor the population of waterfowl, fish and some of the herpetofauna.
4. Study the nutrient cycling in the wetland system.

A field station was set up outside the Park and sampling of different parameters were started from June 2003.

Detrital dynamics

The Detrital dynamics is being studied to assess the detrital cycle especially the pattern of humification and the complexation of soil organic matter fraction (humus) with trace metals in soil / sediment system of the Park.

The first and second phase of sample collection was completed. 1518 soil and sediment samples have been collected so far, out of which 859 samples are already processed and under analysis stage and the rest is yet to be processed.

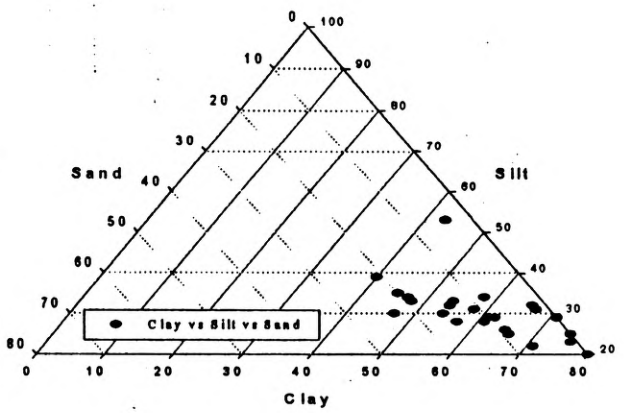
Overall, the texture of KNP soil was found to be clayey loam (CL) to silt-clay loam (SiCL) with clayey to heavy clay in wetland, clay loam in grassland and silty-clay loam in woodland. The soil texture showed a gradual variation along the profile with the surface layers being fine textured and the subsurface layers coarse textured.

The total organic carbon (TOC) and total available nitrogen (TAN) in soil varied among the layers as well as habitats. TOC in the top layer was highest in wetlands (~ 40 g%) followed by grassland (~38 g%) and woodland (~ 20g%). The higher values in the upper layer was due to deposition of partially decayed litters (leaves, plant twigs, roots), which gradually decreased down the profile with gradual decomposition of the detritus and subsequent mineralization along the depth profile. TAN in the top layer was highest in woodland (~0.8g%) followed by grassland (~0.65g%) and wetlands (~0.6 g%). Moreover, Carbon/Nitrogen (C:N) ratio in the soil, being the index parameter for the decomposition of detritic materials, along the profile was also estimated. (Fig-2). Two-way ANOVA test shows that the variation in C/N ratio is highly significant among the soil layers as well as among habitats.

In addition to all the above parameters effort was made to examine the stage and degree of humification along the soil profile, one of the major aspects of this project. For this humic fractions were extracted from some of the soil samples, but could not be fractionated into specific humic fraction, which will reflect the dynamics of detritic materials in different habitats and it will be pursued shortly. However, the humification index was

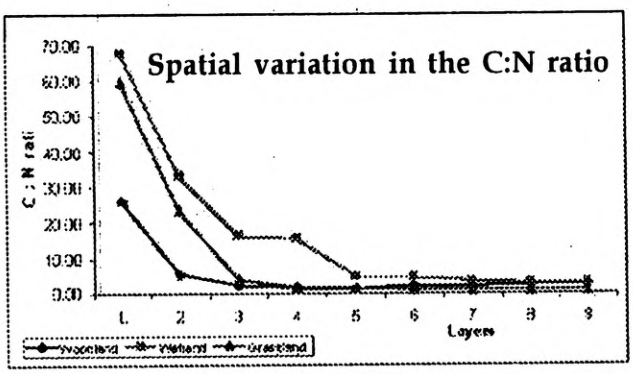
calculated for the samples from the first phase (Table 1). Two-way ANOVA test shows that the index of humification was significant between layers, whereas between habitats it was not.

Soil texture of KNP (clay, silt and sand in %)



Humification index (E_4/E_6) of different soil layers along the profile (Spatial variation)

Soil layers (cms)	E_4/E_6 (Total extract) Woodland	Wetland	Grassland
L (Litter)	3.19	1.57	2.25
10-20	5.62	3.39	4.32
20-30	6.92	4.37	5.60
30-40	5.48	6.23	5.62
40-50	4.78	6.07	5.27
50-60	4.48	4.85	4.57
60-70	4.40	4.91	3.90
70-80	4.59	5.12	3.78
80-90	5.16	5.82	3.82



Limnology

Water samples have been collected from three sampling points selected randomly in each wetland block every month since July 2003. Ajan bund, being the source of water for the park, was also sampled. 540 water samples were collected and physico-chemical properties analysed.

Estimate of the fry entering the Park was done at Chital Van during September 2004. The Park received 1.04 tonnes of fingerlings through 19 mcft of water received from Ajanbund.

The most dominant species was *Puntius* (62%) followed by *Chanda* (13%), *Oxygaster* (8%), *Macrones* (7%) and *Labeo* (6%). Most of these species were recorded during 2003 also, except *Macrones* which is a new record for the Park. In 2003 also *Punitus* was the most abundant species followed by *Chanda Sp.*

Vegetation

Vegetation sampling was done in the Park following quadrate method along predetermined transects at fixed intervals in different habitats. In total 134 quadrats were laid in 11 transects. *Paspalum distichum* was dense and widely distributed in the wetlands as in the late 1980s. *Prosopis juliflora* has colonized in most part of the wetlands.

Birds

We used total count methods to monitor population trends of resident and migratory waterfowl, waders and the piscivores (herons, egrets & storks). Raptors were counted separately. Fortnightly counts were conducted in summer and weekly counts during winter. During 2004-2005, a maximum of 53 species with 5372 birds was recorded in December 2004 as against the 15436 birds of 48 species recorded in January 2004. This, again, was much lower than that recorded in 2003. The dominant waterfowl were Pintail (1049), Coot (1120), Gadwall (480), Shoveller (553), Greylag Goose (1464) and Common Teal (293).

Some of the migratory birds such as the Garganey increased in April 2004, due to delayed return migration. There were 23

Common Crane, but only eight Sarus Crane, as against the 22 in 1993. The mortality due to pesticides besides continuous droughts and shrinkage in water spread area are attributed for the same. There were only two Black-necked Stork.

The heronry too was disappearing as expected; only five species and 359 nests. That too most of them were abandoned due to scarcity of water and fingerlings.

Altogether 15 species of raptors were observed, including the nests of the Honey Buzzard and Lesser Spotted Eagle. Two of the Near Threatened King Vulture were sighted occasionally. The Threatened Greater Spotted Eagle and Imperial Eagle were 6 and 4 respectively in the winter. The Critically Endangered species recorded were the Longbilled Vulture (33) and White-backed Vulture (1) in April 2004. The other Critically Endangered species, the Siberian Crane was not recorded after 2002.

Mammals

An assessment of the dead mammals inside park was also done during the year (June 2004). Maximum number was of cattle (268) followed by Nilgai (16), Spotted deer (14), Jackal (11) and Wild Boar (3). However, the population of vulture was very low.

23. An ecological study on mammals, birds herpetofauna and butterflies in Teesta river basin, Sikkim

Principal Investigator	: Lalitha Vijayan
Co-investigator	: S. Bhupathy
Research Fellows	: Bhoj Kumar Acharya, Joya Thapa, Basundhara Chettri & Sophio Riphung
Project period	: 2002-2006
Budget	: Rs. 49.7 lakhs
Funding source	: MoEF, Govt. of India through Delhi University

Objectives

1. Study the distribution, abundance and ecology of mammals, birds, reptiles, amphibians and butterflies in major vegetation types along Teesta River basin.
2. Assess impacts of various human activities and major threats on the above taxa.
3. Identify of high or unique biodiversity values.
4. Suggest measures for management of biodiversity inside and outside protected ares.

The study was conducted in the forest along the Teesta river basin in Sikkim. The study area covered an altitudinal range between 500-4000 m which was divided into Zone I: < 900m, Zone II: 900- 1800m, Zone III: 1800- 2800 m, Zone IV: 2800- 3800 m and Zone V: >3800m. These zones more or less represent the vegetation type of the respective area.

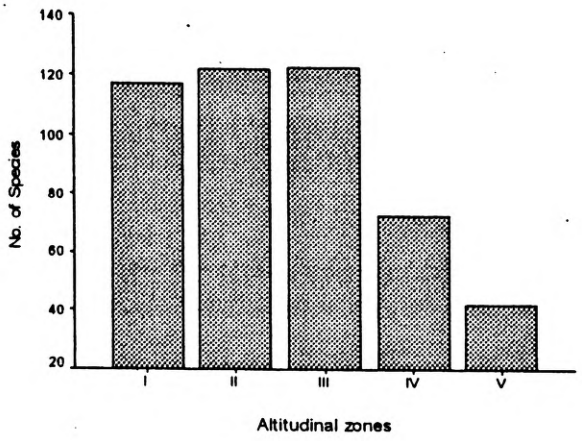
Open width circular plot method was used along the predetermined transects considering the steepness and poor visibility in the study area. In total, there was 1728 such plots over 22 transects; 438 were in Zone I, 410 in Zone II, 344 each in Zone III, & IV and, 202 in Zone V. The data on breeding of birds were also collected to the extent possible randomly in each habitat.

a) Bird species richness and abundance

Two hundred and ninety three species belonging to 43 families of birds were observed in the study area. These include 256 species (14,602 individuals) on regular transects and 37 species outside the transects. The mean number of species/ plot in different altitudinal zones showed weak negative correlation with elevation (z = 0.6). Of the 293 species, 118 occurred below 900 m followed by 122, 124, 74 and 42 species respectively in Zones II, III, IV and V (Table 1).

The observed number of species in different altitudinal zones did not show much difference in the lower three zones (zones I, II and III). The species richness was relatively low in zones IV and V.

Observed species richness of birds in different altitudinal zones along the Teesta Valley



The pattern of abundance and richness of bird species was almost the same. The number of individual birds/ plot showed negative correlation with elevation ($z = 0.7$, $p<0.05$). Zone III had the maximum abundance of birds and richness of species. There was a sharp decline in both the zones IV and V. The Black Bulbul *Hypsipetes leucocephalus* was more abundant in Zones I & II. Similarly, Rufous Sibia *Heterophasia capistrata* in Zone III, Coal Tit *Parus ater* in zone IV and Grandala *Grandala coelicolor* in zone V were the most abundantly recorded species. Bird density was the highest in zone III and lowest in zone V.

b) Species distribution range

The distribution range of species varied from one (habitat specialist) to five zones (generalist). Out of 293 species, 135 (46%) were exclusively restricted to one zone. Only two species (Blue whistling Thrush and White-capped Water Redstart) were common to all the five altitudinal zones and six species to four zones. 30 species were restricted to only Zone I. Similarly 22, 41, 29 and 14 species were restricted to Zones II, III, IV and V respectively. The percentage of exclusive species showed significant positive correlation with altitude ($z=0.8$, $p<0.05$).

c) Seasonality

Overall species richness as well as abundance was high during rainy season. Both richness and abundance were high in zone I in summer, whereas it was in rainy season in zones II, III and IV. Zone V showed a different pattern; species richness was more during rainy season but abundance was more in summer. Zone III was the most diverse zone; species diversity was high in this zone ($H'=3.742$) in all the three seasons. Zone III was followed by zone II where the overall species diversity was 3.607.

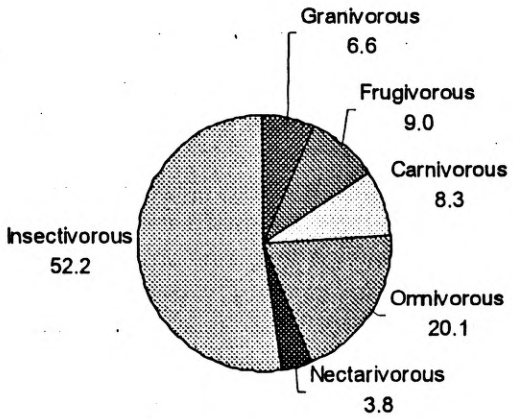
d) Foraging Guilds

Insectivores dominated in terms of the number of species as well as individuals of birds comprising more than 50% in all the habitat types. The number of species of omnivores increased with altitude. In contrast, the species richness of granivores, frugivores and carnivores decreased with increase in elevation but there was not much change in the number of species of insectivores with elevation. The species richness and abundance of nectarivores were relatively lower. The abundance of granivores, omnivores and carnivores increased with increase in altitude. As in the case of species richness, the abundance of frugivores decreased with altitude. The

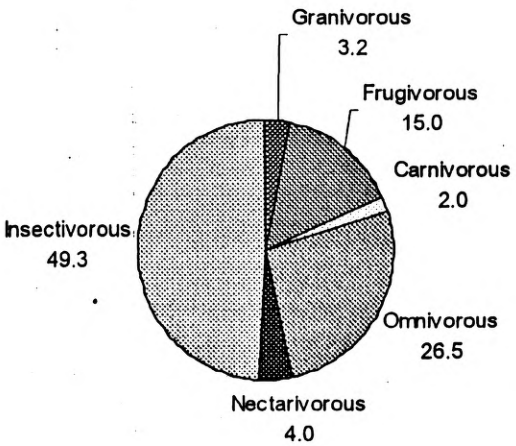
No. of bird species and individuals observed in different vegetation (altitudinal) zones along the Teesta Valley

Zones	Area sampled (in ha)	No. of species	No. of Individuals	Species /ha	Individuals /ha
I	19.8	118	4377	5.9	221
II	19.1	122	3286	6.38	172
III	12	124	4475	10.25	373
IV	19.1	74	1644	3.82	86
V	32	42	831	1.31	26

insectivore abundance showed two peaks one in zone II and another one in zone IV. The pattern of nectarivores abundance was corresponding with the species richness (Figure 2).



Richness



Abundance

Species richness and abundance of birds in different guilds

e) Breeding birds

Opportunistic observations were made on the breeding of birds; 42 nests of 26 species were recorded in four zones with zone III having the highest number of nests. The breeding season observed was April to July, June being the peak breeding period recording 22 nests of 13 species. In addition, breeding records of 16 species were also observed in different zones.

f) Endemic species

Out of eight endemic species of birds recorded from Sikkim, five, namely Rusty-bellied Shortwing, Broad-billed Warbler, Hoary-throated Barwing, Yellow-vented warbler and White-naped Yuhina could be recorded during this study. Rusty- bellied Shortwing, a threatened endemic, seems to be rare as it was sighted only twice in Zone IV, but the other four species are locally abundant and recorded frequently. The distribution of endemics varied from Zones I to III. No endemic bird was seen in zone V.

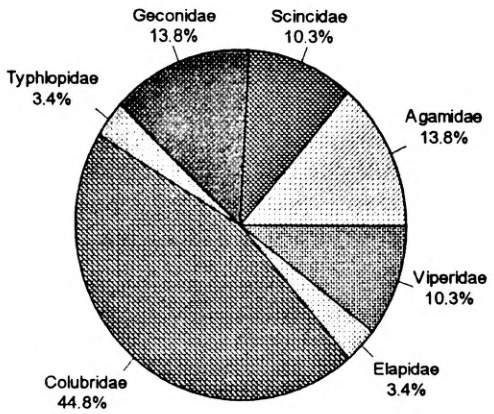
Vegetation sampling of all the 22 transects was completed and the analysis is in progress.

Herpetofauna

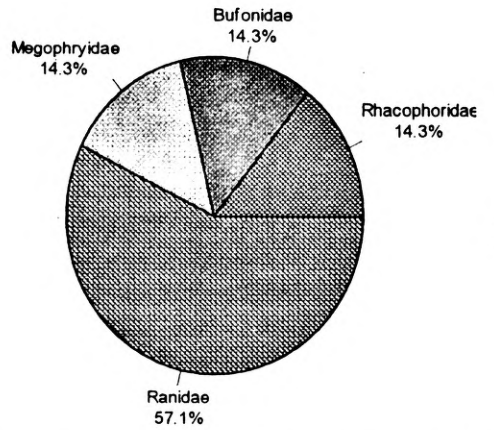
Only a few species of reptiles and amphibians could be encountered during regular sampling due to their secretive nature. Large study area and steep terrain narrowed the possibility of methods such as quadrat and pitfall traps. Hence, Visual Encounter Survey (VES) was followed for regular sampling, though other methods were also used seasonally.

a) Species composition

Thirty-three species of reptiles and 16 species of amphibians were recorded during 1384 hours of visual encounter survey. Representatives of seven families of reptiles were recorded (three lizards and four snakes) out of which Colubridae dominated with 44.8 % followed equally by Agamidae and Geckonidae. In the case of amphibians the present study could record only 4 families, as most of the amphibian species are nocturnal. The survey was carried out during day hours in which Ranidae dominated with 57% followed equally by 3 families, Bufonidae, Rhacophoridae and Megophryidae.



A



B

Familywise distribution of herpetofauna; Reptiles (A) and Amphibians (B) along the Teesta Valley.

b) Relative abundance

Trachischium guentheri was relatively the most abunadant (31.14%) reptile species found along the Teesta Valley followed by *Leiolopisma sikkimense* (21.55%). Species such as *Typlops sp., Japalura variegata, Calotes versicolor* and, *Spenomormous indicum* are other relatively common reptiles found along the valley. Out of the 32 species, four were venomous snakes, namely *Naja kaouthia, Trimeresurus monticola, Trimeresurus* sp1 and, *Trimeresurus* sp 2.

Among the amphibians, Himalayan toad *Bufo himalayana* was the most abundant species, contributing maximum relative abundance (73.96%) followed by *Limnonectes limnocharis* (8.841%). *Bufo melanostictus* and *Rana sp4.* were seen twice but *Rana sp5.* was sighted only once. There was a contrast in the relative abundances of two species of *Bufo*, namely *Bufo melanostictus* and *Bufo himalayana.* In the higher altitudes, the former was the lowest and the latter the highest, whereas in the lower altitude it was vice-versa. *Bufo melanostictus* was restricted to zone I, whereas *Bufo himalayana* showed wider distribution covering zones II, III and IV. It may be noted that *Bufo melanosictus* may be marginally distributed as the range is taken over by its congener. All the five species of *Rana* observed during the study are yet to be identified.

c) Species Richness and Diversity

Species richness and diversity (H') were calculated based on data from Visual Encounter Survey. The highest number of species was obtained in zones I and II. Reptile species encounter rate was high in zone I followed by zone II, but individual encounter rate was high in zone III. Amphibians did not show any pattern of encounter rates with habitats. Both species as well as individual encounter rates were high in zone IV.

The amphibian species richness was very low in zone IV and V beyond 2800m. Only one species of amphibian *Scutiger sikkimensis* was found in alpine and subalpine habitats, whereas no reptiles were encountered beyond 2800m. The abundance showed somewhat different pattern. The highest abundance was in zone III for both reptiles and amphibians.

Species diversity as well as evenness of reptiles was highest in zone I (H'=2.271; E= 0.735) and lowest in zone III (H'=0.809; E= 0.584). Lower reptile diversity in zone III could be due to colder climatic conditions and rapid increase of altitude. Similarly, amphibian species diversity and evenness was high in zone I (H'=1.473; E= 0.670) followed by zone IV (H'= 0.48; E= 0.437) and lowest in zone III (H'= 0.128; E=0.092).

Besides regular sampling, species such as *Dendrolaphis pictus, Elaphe radiata, Elaphe porphyracea, Boiga sp, Naja kaoutia* were recorded opportunistically.

IV. WETLAND CONSERVATION

Wetland, undoubtedly, is one of the most valuable resources for any country. Wise use and conservation of wetlands ensure water, food and ecological security.

SACON's approach to the wise use and conservation of wetlands is focussed on i) documentation of the wetland resource of the country, ii) bringing out a draft national policy and strategy for the conservation and sustainable use of wetlands, iii) making a National Network of Wetland Conservation Areas, and iv) demonstration of sustainable use of wetlands.

24. Conservation and Sustainable Use of Globally Significant and Threatened Wetlands in India (Revised PDF-A for MSP preparation)

Investigator	: V.S. Vijayan
Co-investigator	: S.N. Prasad
Budget	: US $ 25,000/-
Funding source	: UNDP/ GEF

Objectives

1. Demonstrate community-based sustainable utilization strategies for wetland resources.
2. Complement baseline national wetland management and conservation activities.
3. Capacity building in wetland management and local communities.

The UNDP-GEF sponsored PDF-A grant for preparing a detailed medium sized project for demonstrating sustainable utilization of wetland resources with the participation of local community and other stake holders was subjected to several changes in the scope and size. Finally during 2004-2005, it was decided that the projects be confined to two representative wetlands one each from north and south.

Extensive consultations with various stakeholders were made during February-March 2005. Parameters to be considered while selecting the wetlands and the activities to be covered were discussed threadbare. The GEF Empowered committee, chaired by the Secretary, MoEF also gave guidelines for the selection of wetlands. Basically biodiversity value and livelihood of the local community emerged as the core criteria for such selection. Fitting to all these attributes and guidelines were the wetlands of Etawah/Mainpuri in UP and Kaliveli in Tamil Nadu.

Detailed project proposal for the full grant is being prepared and is to be submitted before 30 June 2005.

25. ENVIS centre for Wetland Information System

Investigators	: V.S. Vijayan, S.N. Prasad & Lalitha Vijayan
Project personnel	: A Giriraj, S S Gaikwad & Madhu Routhu
Duration	: Long term (since April 2003)
Budget	: Rs. 6.35 lakhs
Funding source	: MoEF, Govt. of India

The previous ENVIS node of SACON was primarily devoted to Inland wetlands. Subsequent to the review of progress of the work on Inland wetlands, it has been upgraded into ENVIS Centre for three years. The mandate has been enhanced to cover all wetland ecosystems in the country.

Objectives

1. Creation of website on wetland ecosystem with regional language interface.
2. Monthly compilation of news items on wetland ecosystem.
3. Identification of information/ data gaps in the specified subject areas and action taken to fill these gaps.
4. Database creation on wetland ecosystem to be put on website.
5. Contribution of news items for ENVIS newsletter.
6. Establish and operate a distributed clearing houses to answer and channel queries related to the allocated subject.

The work done during the year are given below:

- Completely revamped the previous website (http://www.wetlandsofindia.org) with additional features such as wetland description, biodiversity and its status, photogallery, glossary and publications.

- Creating wetland database on the number of wetlands available at State level and its count on plant and bird species on query basis. This is in progress.

- Second issue of ENVIS newsletters was published in our web portal detailing country level inland inventory, proposed sites for Ramsar and status of Threatened birds.

Currently, the website offers digital data on wetlands in the form of simple JPEG / PDF maps only. With the increasing availability of free open source GIS software, we have initiated our efforts to make available digital content in the form of simple map (DjVu - Lizard tech) and advance map (Alov Map - Web GIS). This appears to be the first attempt in using this tool for environmental application in India.

It is planned to develop full-fledged web portal with the existing useful digital content of approximately one GB.

26. Structural and functional attributes of wetlands of indo-gangetic plains of India with reference to Uttar Pradesh

Investigator	: S.N. Prasad
Co-investigators	: V. Hari Prasad, IIRS, P.S. Roy, IIRS & Lalitha Vijayan
Research Fellows	: Sam Verghese, Prasanth Narayanan S.
Collaborating agency	: Indian Institute of Remote Sensing (IIRS)
Duration	: 2004-2007
Budget	: 25.30 lakhs
Funding source	: ISRO - Geosphere Biosphere Programme

Wetlands assume greater importance not only for their biodiversity values and economic potentials, but also for their role in ensuring drinking water, especially for the millions in the rural India.

Objectives

1. Assess the loss of wetlands over a period of 20 years from 1980-2000.

2. An appraisal of the causes and consequences of the losses on the biodiversity and functional values.

SACON's wetland programmes include documenting and monitoring the wetland resources of the country. The present project is the first of its kind in India where the loss of wetlands over a period of 20 years is being documented. The project initiated during 2004, is confined to the Indo-Gangetic plains.

Wetland features such as river, lake, reservoir, perennial, non-perennial and swamps were extracted from thirty-seven toposheets of the scale 1: 250,000 published by Survey of India (SoI) in 1972 for UP. The satellite imageries used are Advanced Wide Field Sensor (AWiFS) of Indian Remote Sensing satellite (IRS), P6 Resourcesat-1 and, Wide Field Sensor (WiFS) of IRS 1-D. Visual interpretation technique is used initially to extract wetlands from satellite imageries. Wetland statistics of 33 districts were extracted from AWiFS 2004 image by visual interpretation technique. After the temporal maps are prepared, it is proposed to do the change detection analysis. Catchment area of the most dynamic wetlands will be delineated to analyse the reasons for the changes in the wetlands.

Selected wetlands and the wetlands in Allahabad, Mirzapur, Pratapgarh, Sultanpur and Banaras districts were visited in order to assess the status of the wetlands and wetland dependent birds. The field visit was taken up in February and March 2005. Ganga-Yamuna River stretches, Upardhaha thalab, Tones River, Ganga River banks - Ramanagar, Baraundha (Sirsi - Lalganj), were covered for the survey. Vegetation, fishes and reptiles spotted from the sites and threats facing each wetland are also noted.

A total of 8951 birds were counted from the 15 wetlands. Out of this 24.64% was Black-winged Stilt and 21.30% Common Coot. The total species include 55 wetland and 12 wetland dependent birds. Among them one species was threatened (Sarus Crane), while four were Near Threatened (Black-headed Ibis, Black-necked Stork, Painted Stork, Darter). Seven out of the 10 duck species and eight species of waders sighted were intercontinental migrants.

A maximum of 34 species of birds was recorded at site VIII - Barundha (Sirsi-Lalganj), followed by 24 each in site II - Tones River (Khatka Bridge) and site V - Sirsi Marihan Reservoir. The lowest number of species (7) was at the site X - Gomthy River - Dharauhara). Bird abundance was maximum in Sirsi Marihan Reservoir (2457) and in Papha Phool Gnaga River banks and adjacent areas (2399), sites V and XIV respectively. Abundance also was lowest (24) in Gomthy. River - Dharauhara. Birds such as Little Cormorant, Indian Pond Heron and, Little Egret were found in almost all wetlands covered, whereas species such as Dunlin, Peregrine Falcon, Common Teal and, Redcrested Pochard were recorded only in one of the wetlands.

A comparison of the Asian Wetland Bureau's data on waterfowl for 1989 and 1999 show that there is considerable increase in the population from 8126 to 1,48,440. However, the population again declined after six years; in 2005, it was 8951. The decline was pronounced in ducks and teals, namely the Spot-billed Duck, Common Teal, Northern Pintail, Northern Shoveler, Red-crested Pochard. Only the Bronzewinged Jacana and Blackwinged Stilt showed some increase.

Some of the species like Dunlin and Great Thick-knee were not recorded during the earlier surveys.

V. ENVIRONMENTAL IMPACT ASSESSMENT

Of late, with the increasing demands for 'development projects' and the equally or more increasing concern over the biodiversity conservation, the role of Environmental Impact Assessment has become more pertinent than ever.

Moreover, it is a mandatory requirement that any new project proposal should be accompanied by a report of Environmental Impact Assessment for clearance of the project. SACON's team has undertaken three projects during the year.

27. Study of the Migratory Birds in the Environs of the Proposed Barh Super Thermal Power Project, National Thermal Power Corporation Limited

Investigators	: PA Azeez and S Bhupathy
Research Fellow	: PR Arun
Funded by	: National Thermal Power Corporation (NTPC) Limited, New Delhi
Duration	: 1 year (May 2003 to April 2004)

The National Thermal Power Corporation Limited (NTPC), the largest power producer in the country, proposes a Super Thermal Power Project (STPP) at Barh, Patna district, Bihar. The project already got cleared by the Bihar Pollution Control Board (BPCB) and the Ministry of Environment and Forests (MoEF), Government of India. However, the MoEF stipulated that the migratory birds in the Barh area should be studied. At the request of the NTPC, SACON undertook the study, covering all seasons of the year.

The NTPC's Super Thermal Power Plant (STPP) at Barh, Patna district has a capacity of of 3x660 MW. The power plant is located in a low-lying area, between the NH-31 and Eastern Railway connecting Howrah and Patna on the right bank of the river Ganges. The site falls in Mor-Taal, a part of the Mokameh group of Taals. The STPP is expected to utilize about ten million tonnes of coal per annum which would generate huge quantity of ash (~4 million tonnes). The ash will be sent to the ash pond in the Sarhan Taal in the form of slurry.

The scope of the work included field observations of migratory and local birds in

10 km radial distance from the project site covering all seasons of the year. The specific objectives of the study were to; (i) examine the proposed project area and generate baseline data on the flora and fauna, and (ii) identify avian species or groups that may get affected due to the project operation. The study covered all seasons from May 2003 to April 2004 documenting the microhabitats, congregations, time of arrival and period of stay of the waterfowl and other birds in the NTPC project area.

Almost all the study area falling under the Taal is extensively cultivated and hence, the floral species composition is highly altered by human activities. Thus, the cultivated crop and associated species contributed to the vegetation cover of the area to a large extent, especially during cultivable seasons of the year. Trees are poorly represented in the area, because of intensive agricultural activities and extensive inundation during monsoon. In all, only twenty species of trees were recorded from the study sites. 130 species of vertebrate including three species of amphibians, eight reptiles, 101 birds and eight mammals.

Birds observed during the present investigation include 25 species of migrants (largely winter migrants) and 76 species of resident birds. The bird community is more or less homogenous among the locations: the proposed ash pond area, its environs and nearby Ganges. Highest number of species was observed in the Ganges, while the lowest in the proposed ash pond area. A total of 53 aquatic species were recorded in the study area. Number of water dependant avian species of the area is marginally higher (52.5%) compared to the terrestrial ones (47.5%). This could be due to overall wet nature of the area and presence of the Ganges in close vicinity. Only 26 species of water birds were found in the Taal area, while the Ganges had 40 species. Of the 101 species, only 25 were migratory. These include three terrestrial species and the remaining 22 aquatic ones. All the three terrestrial species were found through out the study area. Among the 22 migratory water dependant species, only 10 were found in the Taal area. In all, 23 out of 25 migratory species were seen in close vicinity of the Ganges. Three internationally Threatened or Near Threatened species were observed during this study in small numbers in the general locality.

Mokemeh Taal has been proposed as an "*Important Bird Area*" by the BNHS, based on the criterion of congregation of migratory species. The present study also shows that Taal near Mokemeh is comparatively wet round the year and rich in bird diversity. This Taal is about 25 km on a straight line down stream of the proposed ash pond. In contrast with the proposed ash pond area, Mokameh Taal is relatively richer in bird diversity.

Aggregations of aquatic birds were rarely seen in the ash pond location, the contiguous Taal and other area within 10 km during the present study. However, assemblages of migratory anatids (ducks) were frequent in the Ganges in the undisturbed sand bars and oxbow lakes during day. Indirect evidences such as feathers, droppings, and foot marks of these birds suggest that they visit the shallow marshes of the Taal or crop fields during night for feeding, but not in large numbers. In general, in the ash pond area (Serhan Taal), important microhabitats required for water birds were scanty during winter (i.e. the major migratory season). The Taal, where the ash pond is proposed apparently is not an important bird habitat. However, measures have to be taken so that whatever the few numbers visit the area are not disturbed and the areas are not used for dumping ash remains. Some conservation measures are proposed with the view to reduce the impacts on the birds.

28. Study of Bird Habitats at the Pathiramanal Island, Vembanad Lake, Kerala in View of the Proposed Eco-Tourism Project

Investigators	:	PA Azeez, S Bhupathy and P Balasubramanian
Research Fellow	:	PR Arun
Funding Agency	:	Dept. Ecotourism, Govt. of Kerala
Duration	:	1 year; 2003-2004

The Government of Kerala proposes an ecotourism project of international standard at

Pathiramanal Island of Vembanadu Lake near Kumarakom in Alappuzha district. The Dept of Tourism entrusted SACON with a study to suggest mitigatory measures, if any, to implement the project, protecting the birds in the area.

The major objectives of the study were to; (i) document the base line situation in the island with respect to the flora and fauna (ii) investigate possible impacts and likely ecological perturbations of the proposed project and associated activities and, (iii) identify measures to be adopted to improve and protect birds and their habitats.

The present study, covering all seasons of the year, examined the ecological set up of the area. It explored various measures required to protect the birds in the island and its surroundings. As required by the Department of Ecotourism, attempts were made to identify scientific interventions such as planting suitable trees to improve bird habitats and precautions needed for protection of birds. The present study mainly focused on the Pathiramanal Island. However, to understand the ecological standing of the island, the study also covered the Vembanadu Lake and Kuttanadu backwaters and wetlands falling within a radial distance of 10 km from the island.

Considering the size of the area, the Pathiramanal Island is rich in biodiversity, with a variety of plant and animal species; the latter resident, migrant and occasional visitors.The island has mangrove vegetation along its borders which extends into the interior to a considerable distance in some places. It is also a type locality for one subspecies of fish. The island had a small human settlement, decades ago, but none currently. Hence, the island is in a process of recovery, reverting back to its original ecological community. From an ecological point of view it is better that the island is left without any intervention for its natural return to wilderness.

From an ecotourism point of view, the only marketable resource on the island is its scenic beauty. Limited tourism may be allowed during the day; overnight stay should not be allowed. Nature walk trails could be laid. All essential steps should be adopted for waste management and ecologically benign resources usage. A number of trees have to be planted along the shoreline and also inland area to augment the bird and other animal habitats. Exotic species may be avoided in the area. At leat 100 m from the shoreline should be protected so that it functions as a sanctuary for fishes, other aquatic species and also birds. Round the clock surveillance is recommended so that illegitimate and undue exploitation of natural resources on the island and also illicit activities are avoided. No permanent construction may be allowed on the island.

Further, prior to execution ot the project in the island, a Detailed Project Report (DPR) may be developed and a Comprehensive cumulative Environmental Impact Assessment (CIA) conducted. The suggestions put forth in the present report is intended only for the conservation of the bird habitats in and around the island. Hence, it may not be considered as an Environmental Impact Assessment (EIA) of the proposed ecotourism project.

29. Implementation of conservation plan for flora and fauna for the Yercaud and Kolli mines.

Investigators	:	P. A. Azeez and S. Bhupathy
Duration	:	Three years
Funding agency	:	Madras Aluminium Company (MALCO)

M/s Madras Aluminium Company limited, based in Mettur has been excavating bauxite for aluminium production from Kolli hills and Yercaud Hills for the last few decades from the areas under their lease. Further, to their expansion plans, MALCO got an EIA study for the same. An expert committee of the Ministry of Environment and Forests wanted to look into the wildlife and floral conservation in view of expansion project. SACON was entrusted undertaken this to make an assessment and submitted its suggestions. Major suggestions include, reclamation of mined area with native plant species, creation of biodiversity parks in

the land owned by MALCO, initiation of nature awareness programmes for locals and constitution of local committees. As Yercaud is one of the major areas for Gaur, a plan for conserving this species was also given.

The panel of experts constituted by the MoEF has accepted the suggestions of SACON. Further to this, the MALCO has been asked to implement the conservation plans. In this regard, MALCO requested SACON to supervise the implementation work undertaken by them. This project was initiated from August 2004. The EIA team of SACON makes quaterly visit to the Bauxite mines at Kolli and Yercaud Hills to study the implementation programmes undertaken by MALCO.

30. Environmental Assessment of the Bharathapuzha River Basin - A Pilot study

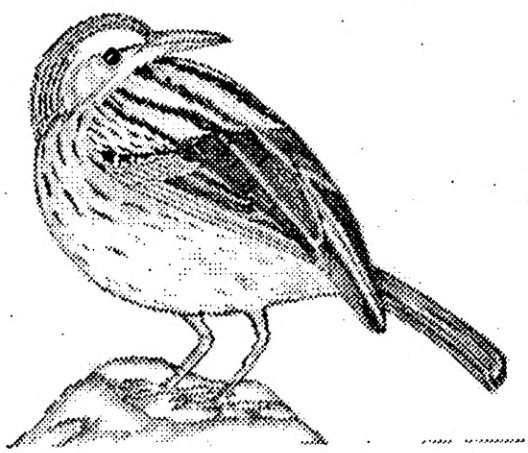
Investigator	:	P.A. Azeez
Project period	:	Two years
Budget	:	Rs. 1.75 lakhs
Funding agency	:	SACON R&D

Objectives

1. Assess the state of environment in the whole Bharathapuzha basin with emphasis on the immediate environs of the hydel and hydroelectric projects.
2. Make an inventory of the major check dams and to assess their utility.
3. Make an assessment of the ground water situation in the basin especially in the upper reaches.
4. Make an assessment of the surface water situation in the basin especially in the upper reaches.
5. Make an assessment of the dams from environmental economics point of view.

The river Bharathapuzha is the second longest one in the state its basin is the largest in Kerala extending to 6186 km^2, of which 1786 km^2 falls within Tamil Nadu. The basin spreads over Palakkad, Malappuram and Trichur districts in Kerala and Coimbatore district in Tamil Nadu. This river is the lifeline of at least 6 million people in the districts of Palakkad, Malappuram and Trichur. Of late, the basin has been drying up at an alarming rate. The hydel projects built on its tributaries along with many check dams built on the smaller tributaries for irrigation have greatly contributed to the present grave state. The river is reduced to pools and puddles and its trickles along its course during summer.

Secondary information on the following were collected during the year: (i) most of the published literatures on the Bharathapuzha (ii) unpublished documents such as reports from PWD, Revenue and Kerala State Electricity Board pertaining to the area and, (iii) land use and ownership data from the Basic Tax Register (BTR) of the Palakkad district. Field surveys on the fauna and flora of the area would be conducted during 2005-2006.



UNIVERSITY DEPARTMENT

The SACON continued to have the affiliation with the Bharathiar University. The University Programme of SACON had 33 students during the year; 20 for Ph.D., 3 for M.Phil. and 10 for M.Sc. One Ph.D., all M.Phil. and nine M.Sc. students completed their studies and submitted theses. M.Sc. students belong to apart from Bharathiar University, M.G. University, Kottayam; Aligarh University and Bharathidasan University.

Name of Guide & Department	Name of Student	Course	Topic of research	Status
Dr.V.S.Vijayan (Zoology & Env.Science)	P. Balakrishnan	Ph.D	Status, Distribution and Ecology of the Grey-headed Bulbul *Pycnonotus priocephalus* in the Western Ghats	Ongoing
	Amlan Dutta	Ph.D	Ecology of the Dusky Horned Owl in Keoladeo National Park	Ongoing
Dr. Lalitha Vijayan (Zoology & Env.Science)	K.S. Anoop Das	Ph.D	Monitoring the Bird community in the Silent Valley National Park	Ongoing
	S. Somasundaram	Ph.D	Ecology of the Nilgiri Wood Pigeon	Ongoing
	J. Umamaheshwary	Ph.D	Ecology of the Nilgiri Pipit	Ongoing
	Bhoj Kumar Acharya	Ph.D	Ecology of Bird communities along the altitudinal gradient in the Teesta Valley, Sikkim	Ongoing
	Sophio Riphung	Ph.D	A study on the butterfly communities along the altitudinal gradient in the Teesta Valley, Sikkim	Ongoing
	D. Nirmala	M.Phil.	Non-breeding ecology of the Pied Bushchat *Saxicola caprata*	Thesis submitted
	N. Ezhilarasi	M.Phil.	Habitat utilization of the Andaman Crake *Rallina canningi*	Thesis submitted
	S. Prasanth Narayanan	M.Sc.	Status and ecology of the breeding wetland birds in the KTDC tourist complex, Kumarakom, Kerala	Thesis submitted
	Jisha Kurian	M.Sc.	Ecology of bulbuls in Anaikatty	Ongoing
	Rohit Singh	M.Sc.	Population and habitat use of the mammals in Keoladeo National Park	Thesis submitted
Dr. R. Sankaran (Zoology)	Shirish Manchi	Ph. D.	*In-situ* & *Ex-situ* conservation of the Edible-nest Swiftlet *Collocalia fuciphaga* in the Andaman & Nicobar Islands	Ongoing
Dr. S. Muralidharan (Env.Science)	R. Jayakumar	Ph.D	Heavy metal contamination in freshwater fishes of Inland wetlands of India	Ongoing
	V. Dhananjayan	Ph.D.	Impact of Environmental contaminants in Indian Avifauna	Ongoing
	A. Alaguraj	Ph.D.	Organic contaminants in the marine fishes available in Coimbatore and their suitability for human consumption	Ongoing

Name of Guide & Department	Name of Student	Course	Topic of research	Status
	R. Karuppuswamy	M.Sc.	Pesticide residues in the tissues of three species of birds in Coimbatore, Tamil Nadu	Thesis submitted
	V.S. Prabhu	M.Sc.	A comparative account on the lead contamination in Crows and Little Cormorant in Tamil Nadu	Thesis submitted
Dr. P.A. Azeez (Env. Science)	Baladhandapani	Ph.D	A Techno-economic evaluation of common effluent treatment plants (CETP) in Tiruppur	Ongoing
	B. Anjan Kumar Prusty	Ph.D	Humification and trace metal dynamics in a wetland sediment: The case of KNP, Bharatpur, India	Ongoing
	G. Sadeetharan	M.Sc.	Humification pattern along the soil profile in a wetland-terrestrial ecosystem complex	Thesis submitted
	P. Sangeetha	M.Sc.	Spatial variability in alkali metals in the soil profile of a mixed habitat system	Thesis submitted
	R. Vasantha Kumar	M.Sc.	Carbon and nitrogen dynamics along the soil profile of a mixed habitat system	Thesis submitted
	R. Geetha	M.Sc.	Temporal variability of select alkali metals in a wetland system	Thesis submitted
Dr. S. Bhupathy (Zoology)	A.M.A. Nixon	Ph.D	Population and resource utilization pattern by reptiles in Upper Nilgiris, Western Ghats	Thesis submitted
	Debanik Mukherjee	Ph.D	Resource utilization patterns of reptiles in Anaikatti Hills, Western Ghats	Ongoing
	Basundhara Chettri	Ph.D	Altitudinal distribution of Herpetofauna along the Teesta River Valley, Sikkim	Ongoing
	J. Gokulakrishnan	Ph.D.	Ecology of sea turtles along the Poompuhar coast, Nagapattinam, Tamil Nadu	Ongoing
(Co-guide)	Joya Thapa	Ph. D.	Ecology of mammals along the Teesta River Valley, Sikkim	Ongoing
Dr. P. Pramod (Zoology)	R. Eswaran	Ph. D.	Ecological studies on insect communities of Anaikatty hills	Ongoing
Dr. P. Balasubramanian (Botany)	M. Gunasekaran	Ph.D	Sthalavriksha practice in conservation of plant biodiversity in Tamil Nadu	Ongoing
	K. Anitha	M.Phil.	Assessment of tree community and regeneration in Anaikatty hills, Western Ghats	Thesis submitted
	N. Rajesh Kumar	M.Sc.	Ecology and habitat utilization by the Indian Peafowl, *Pavo cristatus* in Anaikatty hills, Western Ghats	Thesis submitted

SEMINARS, WORKSHOPS

Inland Wetlands of India

A one day national seminar on Inland Wetlands of India was conducted on 15th February 2005 at New Delhi along with the release of the following books by the Hon'ble Minister for Environment and Forests, Government of India.

1. Inland Wetlands of India - Conservation priorities. 550 pp
2. Inland wetlands of India - A conservation atlas. 220 pp

Around 225 dignitaries including professionals, academics, administrators, diplomats and students attended the seminar.

Mr. A. Raja, Hon. Minister gave his Presidential address highlighting the steps taken by the MoEF and proposed to be taken for conservation of wetlands. Excerpts are given below:

Thiruvalluvar, the Saint Poet, 2000 years back, in one verse has captured the importance of wetlands, biodiversity and climate change, as ***"No life on earth can exist without water, and the ceaseless flow of that water can not exist without rain"****.*

As Ismail Serageldin, Chairman of the World Commission on Water for the 21st Century observed that more than one-half of the world's major rivers are being seriously depleted and polluted, degrading and poisoning the surrounding ecosystems, thus threatening the health and livelihood of people who depend upon them for irrigation, drinking and industrial water. The situation in India is no less true. A deep introspection is essential.

Significant achievements of my Ministry in the Wetland sector include:

- *Management Action Plans for all the identified wetlands; many are in various stages of implementation.*
- *Funding conservation of Wetlands in: Punjab (Ropar and Kanjli), Jammu & Kashmir (Wullar and Tso Morari), Himachal Pradesh (Chandertal and Pong), Orissa (Chilka), Manipur (Loktak) and Gujarat (Nalsarovar).*
- *Declaration of 16 more wetlands as Ramar sites.*

In addition, 12 more sites are being processed. We realize that this is just a beginning. Since India's wetlands are vastly rich in biodiversity, MoEF will strive to add many more sites as nationally and internationally important sites. Recognizing the need for declaring potential wetlands as Ramsar sites, several attempts were put in place for the last two decades.

The latest effort of evolving a comprehensive network of inland wetlands, was initiated by Ministry though the assistance of UNDP under Country Cooperation Framework (CCF1) which began in 1999 and ended in 2002

Under this initiative, the Salim Ali Centre for Ornithology and Natural history (SACON), Coimbatore was chosen to be the executing agency for this nation-wide inland wetland conservation. I understand the SACON has done as a truly participatory and interdisciplinary programme, involving scientists from different disciplines of Regional Remote Sensing Centers of Bangalore, Dehradun, Jodhpur, Khargpur and Nagpur. In addition, the Maharastra State Remote Sensing Center, Nagpur is also involved. A most interesting part of th participatory exercise is involvement of more than 500 volunteers across the breadth and width of the country with 15 skilled, committed State coordinators. The MoEF believes capacity building of the above magnitude is a very useful and highly desirable goal in providing a strong foundation for wetland conservation in the country. I was informed that a number of outputs relevant to wetland inventory and developing methodologies of wetland conservation and wise-use are given.

According to the study, I note, there has been a loss of about 38% of wetlands across the country, since the last 10 years. And, in some districts the loss is up to 88%. Compounding the loss of wetlands, almost all the wetlands from 14 states appear to be polluted. In many cases, the fishes are not fit for human consumption, because of the high levels of heavy metals or organochlorine pesticides. It is a cause for great concern that not even one of the over 1700 fishes studied from 170 wetlands was free from pesticides/heavy metal.

It is sad to note that the wetlands appear to be one of the most preferred landfills for dumping solid wastes from a variety of origin and an ultimate end point for discharging industrial and domestic untreated effluents.

Apart from filling the wetland and contaminating the water body, such wastes pollute the air; the waste containing plastic origin is burnt in many cases. One of the studies shows that the human milk in some such areas contains 'dioxine', a deadly carcinogenic chemical, which got into the air because of the burning of plastics.

Considering all these, the nation should conceive a determined, proactive National Wetland Conservation Strategy and Action Plan with adequate support of legal instruments and implement it. I am glad to note that SACON has provided vital inputs for such an action plan.

My ministry is seized of this grave situation and is trying to see how further conversion of wetlands can be stopped; and how pollution, at least in the wetlands which are used for drinking, can be reduced.

I also note that the SACON suggests launching a "water revolution" in the same spirit as of the green revolution.

My Ministry's long-term vision of wetland conservation is built on the premises of conservation of wetland biodiversity; economic benefit to the people; employment generation and, water for drinking & irrigation.

I look forward to the cooperation of our countrymen to protect and use all the ponds, tanks and lakes, together called wetlands, in the country.

You may remember the famous words of Albert Einstein, "Our task must be to widen our circle of compassion to embrace all living creatures and the whole of nature in its beauty". I would like to add that this is vital for our own survival.

After this, promising address of the Hon'ble Minister, the following four papers were presented.

1. Documentation and monitoring of the Inland Wetlands of India : *S N Prasad*

Dr A K Tiwari from the Regional Remote Sensing Service Centre, Dehra Dun explained the detailed methods employed to map the wetlands while Dr S N Prasad explained the estimate, extend and loss of wetlands in the country. As per the study the country has more than 7 million ha of freshwater wetlands. The loss during the last 10 years (1991-2001) was about 38%.
This dealt mainly with methods for documenting and mapping the wetlands of all size classes, and a scheme for monitoring them.

2. Wetland Biodiversity Prioritization: *Lalitha Vijayan*

The paper explained the methods followed to prioritize the wetlands, for long-term conservation, using the status of birds as the major criteria. 655 wetlands across the country were prioritized for establishing a National Network of Wetland Conservation Area. As per the Ramsar criteria 199 among them are qualified to be declared as Ramsar sites.

3. Environmental contaminants in the Indian Wetlands : *S Muralidharan*

Since Dr. Muralidharan could not make it to Delhi, as he was indisposed, Dr. Vijayan summarized the results of the studies on 1700 fishes collected from 170 wetlands across the

country. Levels of pesticides and heavy metals on the fishes in each state, comparision of the concentration among the fishes inter and intra state, levels in respect of the permissible levels prescribed by WHO were highlighted. It was alarming that none of the 1700 fishes was free from pesticides and heavy metals.

4. Proposed Wetland Conservation Programme: ***V S Vijayan***

A detailed presentation was given on the outline of a National Wetland Conservation Strategy and Action Plan proposed by a team of scientists of SACON, some of whom have more than 25 years of experience in wetland studies.

1. Framing a National Wetland Conservation and Sustainable Use Act

   i. This should give a legal support for protecting wetlands in the country, deciding ownership and adequate scope for sustainable harvesting of the resources.

   ii. A complete ban on conversion of wetland of 0.5 ha and above in size.
   This is the most urgent action to be taken. Further erosion of wetlands will pose a serious threat to the availability of drinking water, especially for the millions in rural India.

   iii. Creation of a National Wetland Authority
   Such an Authority should be made responsible to implement the national action plan to oversee the legislation, liaise with line agencies, consultations with states, and also for enforcement and monitoring. Conservation and management of all types of wetlands such as freshwater, coastal, marshes, swamps, and mangroves should be brought under this authority.

   iv. A provision for constituting an Empowered People's Committee to prevent dumping of waste and polluting the wetlands. Such proactive legal provisions are required to stem the ever-increasing levels of solid wastes and industrial effluents throttling the wetlands and making life impossible in the surrounding areas.

   v. A state level and panchayat level authority for management and monitoring of wetland. Such authority should ensure the full participation of women.

   vi. A provision to ban the use of chemical pesticides on the immediate vicinity of wetlands and, a legal provision to support the farmers for a minimum period of three years for organic farming in such areas.

2. Inclusion of all types of wetlands (freshwater, coastal, marshes, swamps, mangroves, waterlogged areas) in the land use classification in the country.

3. National Wetland Biodiversity Register. Documentation of the wetland resource is the most important step.

   This document will have two parts: (i) a list of wetlands with size and (ii) biodiversity of wetlands.

   Starting from each village pond of 0.5 hectare and above in size to the largest wetlands in the area should be identified; given a registration number and located in the village map. These should be further confirmed and documented by remote sensing data.

   A biodiversity register, akin to the People's Biodiversity Register should be initiated involving a spectrum of stakeholders including school children, farmers, village level functionaries, officials of the various line agencies. The entire work should be coordinated by school/ college teachers and women from the respective villages.

4. An inventory of 'user groups' also should be prepared while collecting information

for biodiversity register. It should also list out the priorities of the communities on the particular wetland resources.

5. Prioritization of wetlands at three hierarchial levels.

   The three categories are: wetlands of international, national and local significance. While definition for the wetlands of international importance exists, it is yet to be fixed for those of national and local significance. A prioritization matrix has also to be developed.

6. Develop a sustained and serious programme for monitoring wetlands

   This should have a three-fold approach;

   i. A completely participatory programme involving the stakeholders, communities, school children and other interested individuals and institutions.

   ii. Adoption of particular wetlands by the local schools, preferably those schools having a National Green Corps (NGC) unit .This unit would be involved fully in monitoring activities.

   iii. Annual waterfowl census

   As a part of the monitoring programme, a national census of waterfowl may be conducted every year with the active participation of school children, college students, NCC , NGOs and NSS volunteers. Capacity building for such a massive exercise, will *inter-alia* include production of pictorial guide for identification of waterfowl and conducting a large number of village level workshops. This will not only create awareness among the public but also give a useful tool to gauge the health of various wetlands.

7. Development of management plans for wetlands

   The three categories of prioritized wetlands should have clearly identified set of management plans. These should be based on hydrological, ecological and socio- economic dimensions. Community involvement should be mandatory, and Traditional Ecological Knowledge (TEK) should be effectively used.

8. Establish a National Wetland Inventory and Monitoring Programme

   Such a programme should be analogous to the current national forest inventory and monitoring. The survey should be done at least once in two years. This should go in tandem with the village level survey and monitoring as mentioned under point 4 and 6.

9. Evolve a policy frame work for conservation and sustainable use of identified wetlands

   Considering the multiple resource use values, the legal frame work has to be developed in such a way that it be all exclusive, yet be sensitive to people and livelihood. Wetlands having socioeconomic values and where people have been traditionally living on the wetland resources should be considered as Community Reserve.

10. Bring wetland management in the overall context of watershed development.
    Since wetlands are integral to the watershed and are dependent on it, it is essential that they are brought under the watershed development programme.

11. Develop economic evaluation of wetlands and integrate it with National Resource Accounting (NRA)
    The economic and ecosystem service values of the wetlands should be assessed using different valuation techniques and the results brought out regularly. This will inter-alia remove the traditional negligence of the wetland.

12. Encourage wetland productivity studies on a long-term basis by identified organizations from different parts of the country. This would bring out indisputable data on wetland productivity, which is many times more than that of other ecosystems. Moreover, it would be an excellent tool to check the ecosystem health.

13. Establish a National Wetland Information System
A system for effective database, communication, dissemination of knowledge, sharing of data on wetlands between and among the whole range of stakeholders has to be developed.

14. Restoration of wetlands
The village level planning should have a provision to revive and restore the 'dying wetlands' of the respective villages.

15. Capacity building in monitoring, management planning, EIA and wetland restoration.
Training should be given at various levels for monitoring the wetland, which involves various stakeholders and school children.

Also people who are involved in management, should be exposed to the various techniques and approaches of wetland management which are strikingly different from the forest management.

16. Promote a strong scientific basis for policy and management initiatives
Fundamental knowledge base on wetland ecology should be strengthened. That the wetland is a unique system and the wetland science is totally different from that of any other ecosystems is to be understood and recognized. The role of wetlands in hydrology, wetland as a habitat for a variety of species, causes and consequences of wetland loss on such species are to be addressed.

17. Establish international link and cooperation to share waters involving trans-boundary issues and to conserve wetlands of mutual interest.
Identify and settle all outstanding issues concerned with wetland resources and also to strengthen the various international treaties and conventions related to wetlands, waterfowl and crane.

18. A nation-wide awareness programme on the need for conserving wetlands and involving people in conservation.
The nation should accord high priority to formulate and implement a National Wetland Conservation Strategy and, National Wetland Conservation and Sustainable Use Act incorporating the above action points.

The country must launch a "water revolution" in the same spirit as that of the green revolution to ensure water and food security, especially to the millions in the rural India.

National Consultation on a GEF PDF - A grant for a Medium Sized Project on conservation and sustainable use of wetlands

SACON has to develop a project for demonstrating sustainable use of wetlands resources without compromising their biodiversity values, with the total participation of local communities and other stakeholders. It was decided to confine the work on two wetlands; one each from north and south.

The workshop focused on two themes: the criteria for selecting the wetlands and, the aspects to be covered in the project. In all 38 experts from various organizations participated and gave their inputs in the one-day workshop.

NATURE EDUCATION PROGRAMMES

Coordinator	:	P. Pramod Nature Education Officer
Nature Education Assistant	:	Gomathi (since 1.8.2004)
Duration	:	Long term
Budget	:	3 lakhs
Funding	:	SACON R & D

The following programmes were conducted during the year 2004 - 2005.

Sálim Ali Nature Club Network

The Sálim Ali nature club network for the school children was expanded to 102 schools. Guest lectures, nature awareness campaign, one-day nature camps, nature camps for student artists, student researches and Children's Ecology congress were conducted during the year. More than 8000 students were benefited from these activities. 2100 students visited SACON for the one-day camps. About 1000 students were involved in the common bird monitoring of south India; 110 in specific student projects and 35 in the nature camp for the student artists. 2500 students visited the exhibition. About 3000 students were benefited from the various other activities such as slide shows and lectures in the schools and nature awareness field trips to forests.

First Children's Ecological Congress

The first ever Children's Ecological Congress in the country was conducted from 8 to 10 January 2005. This congress was the first of its kind and 100 students from 20 schools participated in the programme. Thirty-five research projects covering biodiversity documentation, conservation, pollution monitoring and alternatives for environment unfriendly activities undertaken by students were presented. Methods followed included field surveys, observations, experimentations and innovative creations. The proceedings of the Congress was published as a book titled "Environment in Student Perspective". All presentations and interactions were evaluated by a jury comprising scientists. Six students were selected as the Young scientists of the year. Ms. V. Muthulakshmi of PSGG Kanya Gurukulam and D. Saranya of Kadri Mills Hr. Sec. School, Coimbatore were the first two.

The Children's Ecological Congress was inaugurated by the Commissioner of Coimbatore Corporation Mr. Anil Meshram IAS in a function presided over by the Vice Chancellor of Tamil Nadu Agricultural University Prof. C. Ramasamy. The valedictory session on the third day was presided over by Prof. K. Kulanthaivel, Chancellor of Avinashilingam Deemed University and the valedictory address was delivered by Addl. PCCF of Tamil Nadu Mr. R. Sundararaju IFS.

Vatavaran Environmental Film Festival

VATAVARAN, an exclusive environmental film festival, co-ordinated by Centre for Media Studies, New Delhi, screened thirty award-winning movies at Coimbatore at SACON's initiative. About 2500 students and 500 people from different walks of life enjoyed the movies.

Nature Camp for the Student Artists

One nature camp for the student artists from various schools was conducted. The students stayed at SACON for two days experienced the semi-wildness; learned more about birds and butterflies, did bird watching trips, and painted the common butterflies with oil paint on canvas. Twelve best artist students of the previous year were felicitated with a cash prize and certificate by Dr. V.S. Vijayan, Director, SACON.

Sálim Ali Nature Exhibition

A Nature Exhibition was held during the Salim Ali Birth anniversary celebrations. Students from Salim Ali-Nature club exhibited various models, nature collections, observation reports and nature paintings.

Student research programmes

Small research programmes were given to school students to inculcate scientific temper in the young minds. About 2000 students from 20

schools participated in 35 research projects, 110 students took more active role. Each team had 3-6 students and one teacher as a guide. All topics were related to nature conservation, biodiversity, environmental pollution and conservation of water. The reports were submitted to SACON.

Common Bird Monitoring Programme

The population of 40 common birds of South India is being monitored by about 1000 students in about 100 areas in Kerala and Tamil Nadu. In Kerala the programme is being conducted in collaboration with Malabar Natural History Society, Calicut

Teachers Training programme

One training programme was conducted during the year. 54 teachers who co-ordinate the Salim Ali nature club activities in their respective school attended these training programme. Apart from the lectures, nature club activities for the year 2004-05 was also finalised at the meeting.

Sálim Ali Trophy

This year 1050 students from 50 schools attended the nature competitions. The competitions were conducted in 16 different items and 81 students from 24 schools bagged the prizes. The Salim Ali Trophy for the school which scored the highest in nature competition was secured for the fourth consecutive year by SBOA Metric. Hr. Sec. School, Coimbatore. The first Rolling Trophy was permanently retained by them last year for getting it for three consecutive years.

Nature Education Award

The school which performed the best in nature education activities for the year was selected based on their overall performance for nature awareness. Kadri Mills Hr. Sec. School, Oddarpalayam, Coimbatore won the award for the year 2004-2005.

Young Bird watcher of the Year Award

'Spot the Bird', a star competition introduced last year for identification of birds was continued during the year. Photographs of 30 birds were projected on the screen, and the students had to identify each of them in 30 seconds. Ms V. Muthulakshmi, VIII std student of PSGG Kanyagurukulam Hr. Sec. School and, Mr. Anbarasan IX std Govt. High School, Devarayapuram received the 'Young bird watcher of the year 2005' award for the junior and senior respectively.

World Wetlands Day

Students of Salim Ali Nature club network observed World Wetland Day by visiting Sulur and Singanellur wetlands in Coimbatore and making observations on the migratory and residents birds.

College Nature Club Network

About 500 college students attended the nature camps at SACON. Research projects were introduced for the College Nature club also. Notable one is the regular bird monitoring of Singanallur Lake by the members of PSG Arts and Science College. Monitoring of campus biodiversity is another project initiated among college students.

Educational visits to SACON

Some of the educational institutions made arranged trips to SACON. This include college teachers who had refresher courses in Bharathiar University and Avinasalingam University, trainees of State Forest Service College and State Forest Rangers College Coimbatore. Lectures were given by SACON scientists on various aspects of natural history, environmental contamination and biodiversity conservation.

Sálim Ali Naturalist Forum

The Naturalist forum organized for the general public was quite active during the year. Fourteen discussion meetings were held in different areas. The members were taken for bird watching trips to Silent Valley National Park, Longwood shola at Kotagiri, Velliangiri Hills and Singanallur Lake. Three special guest lectures were conducted. Forum facilitated the members to take part in the Wildlife census

conducted by Tamil Nadu Forest Department in Mudumalai Wildlife Sanctuary. Many members actively participated in the nature education activities of SACON. Six slide shows and one documentary film show on nature themes were conducted for the members. Annual Day of the forum was observed by planting 120 saplings in the SACON Campus.

Sálim Ali Memorial Lecture

Dr. Erach Barucha, Director, Bharathiya Vidyapeeth Environmental Education and Research Centre, Pune delivered the Salim Ali Memorial Lecture of the Year. His lecture on the 'History of Conservation in India' bringing out the major events in the conservation movement in India, especially the role played by the Bombay Natural History Society was both informative and inspiring. The lecture was held at the Golden jubilee Hall, Tamil Nadu Agricultural University and over 200 persons attended the same.

ORGANISATION

The SACON Society comprises the President, all members of the Governing Council (17); five nominees of BNHS; two faculty members of SACON and 100 members nominated by the Governing Council every three years. The honourable Minister for Environment & Forests, Government of India is the President of the society and, Director, SACON the Member Secretary (Appendix I).

The Society during 2004-2005, had 87 members. Mr. A Raja, Honourable Minister for Environment and Forests, Government of India was the President.

Administration of SACON is vested in a Governing Council comprising 17 members including seven ex officio members, nine nominees of the Governing Council, and the Director, SACON as the Member Secretary. The Chairman is the Secretary/ Spl. Secretary/ Addl. Secretary, MoEF, Govt. of India.

The Governing Council is advised by a Finance Committee and a Research Advisory Committee. It also has a Building Subcommittee to go through the nitty gritty of the construction.

Research activities have been organized under five research divisions, namely Conservation Ecology, Ecotoxicology, Environmental Impact Assessment, Landscape Ecology and Restoration Ecology. The scientific staff strength of the year was nine with three Senior Principal Scientists, four Senior Scientists, one Nature Education Officer and the Director.

The administrative section had a Senior Finance Officer, Junior Administrative Manager, Personal Assistant to Director, Administrative Assistant, Accounts Assistant, Office Assistant, Stenographer and Receptionist.

SACON Society

The 14th Annual General Meeting of the Society was held on 14 August 2004 at SACON. The President, Mr. A Raja chaired the meeting.

Governing Council

The Governing Council met on 13 August 2004. Dr Prodipto Ghosh, IAS, Secretary, MoEF was the Chairman up to February 2004 and since then it was Mr Suresh Chandra, IAS, Special Secretary.

Research Monitoring and Advisory Committee (RMAC)

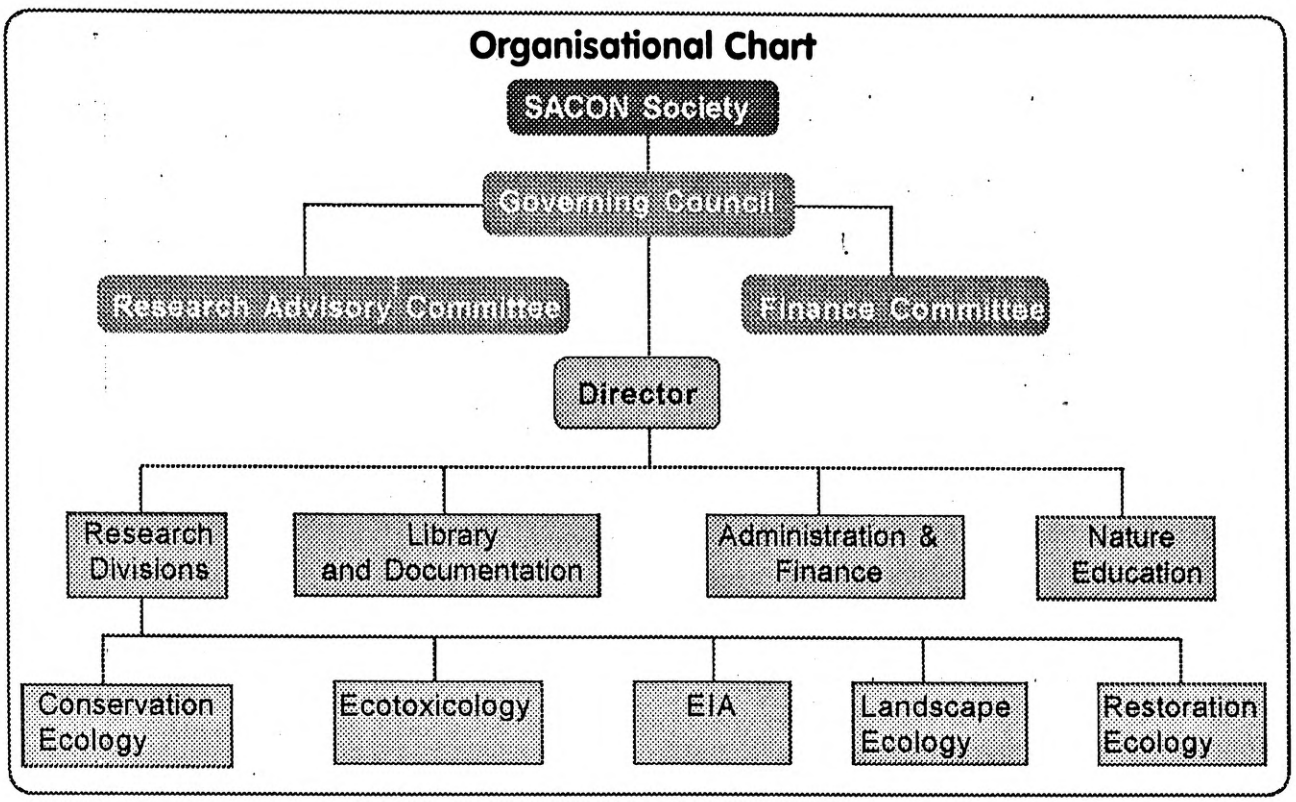
The Research Monitoring and Advisory Committee of SACON consists of 15 members nominated by the Governing Council. The RMAC met twice during the year (13 July 2004 and 15 January 2005) and reviewed the ongoing research projects and evaluated the new projects submitted by the faculty.

Members of the Governing Council

Chairman	Dr Prodipto Ghosh, IAS, Secretary, MoEF (up to February 2005) Mr Suresh Chandra, IAS, Special Secretary (since March 2005)
Joint Secretary & Financial Adviser	Mr Niranjan Pant (up to February 2005) Mr P K Mishra, IAS, Addl. Secretary and Financial Advisor, MoEF (since March 2005)
Secretary to the Govt. of Tamil Nadu, Dept. of Environment and Forests	Mr S P Elangovan, IAS (up to July 2004) Mr Ajay Bhattacharya, IAS, (from August 2004 to March 2005)
Vice Chancellor, Bharathiar University	Dr S Sivasubramanian
Director, Bombay Natural History Society	Dr A R Rahmani
Chairman, Centre for Ecological Science, Bangalore	Dr N V Joshi (up to June 2004) Dr R Sukumar (since July 2004)
Outstanding Scientists Category (3)	Dr Madhav Gadgil (from August 2004 to July 2005) Dr Uma Shannker (since August 2004) Vacant - 1
Management Expert	Vacant
Chief Executive of a lead bank in the southern India	Vacant
Representatives of the corporate bodies/ public sector undertakings (4)	vacant
Nodal Officer of SACON in the MoEF	Dr S Kaul
Director, SACON (Member Secretary)	Dr V S Vijayan

Members of the Research Monitoring and Advisory Committee (RMAC)

1. Dr J R B Alfred, (Director, Zoological Survey of India), Chairman
2. Dr R Sukumar, Chairman, Centre for Ecological Sciences, Bangalore; (since July 2004)
3. Dr A R Rahmani, Director, Bombay Natural History Society, Mumbai
4. Dr Sukhdev Thakur, IFS, PCCF & Chief Wildlife Warden, Tamil Nadu
5. Mr P K Surendranathan Asari, IFS, PCCF and Chief Wildlife Warden, Kerala (up to July 2004)
   Mr B S Corrie, IFS, Chief Wildlife Warden, Kerala (from August 2004 to January 2005_
   Mr V Gopinathan, IFS, Chief Wildlife Warden, Kerala (since February 2005)
6. Dr R M Ray, IFS, Chief Wildlife Warden, Karnataka
7. Mr Hitesh Malhotra, IFS, Chief Wildlife Warden , Andhra Pradesh
8. Dr N V Joshi, CES, Bangalore
9. Mr Pratap Singh, IFS Conservator of Forests, Port Blair
10. Dr D N Mathew, Retd. Prof. Of Ornithology, Calicut University
11. Dr S Kaul Director, MoEF, New Delhi
12. Dr (Mrs) Lalitha Vijayan, Senior Principal Scientist, SACON
13. Dr S N Prasad, Senior Principal Scientist, SACON
14. Dr P A Azeez, Senior Principal Scientist, SACON
15. Dr V S Vijayan, Director, SACON, Member Secretary



STAFF OF SACON

Scientific

Director	:	Dr. V.S. Vijayan, M.Sc., Ph.D.
Conservation Ecology	:	Dr. Lalitha Vijayan, M.Sc., Ph.D. (Senior Principal Scientist)
		Dr. Ravi Sankaran, B.Sc., Ph.D. (Senior Scientist)
		Dr. S. Bhupathy, M.Sc., Ph.D. (Senior Scientist)
Landscape Ecology	:	Dr. S.N. Prasad, M.Sc., Ph.D. (Senior Principal Scientist)
		Dr. P. Balasubramanian, M.Sc., Ph.D. (Senior Scientist)
Ecotoxicology	:	Dr. S. Muralidharan, M.Sc., Ph.D. (Senior Scientist)
Environmental Impact Assessment	:	Dr. P.A. Azeez, M.Sc., Ph.D. (Senior Principal Scientist)
Restoration Ecology	:	Vacant
Nature Education Officer	:	Dr. P. Pramod, M.Sc., Ph.D.

Technical

Library & Documentation	:	M. Manoharan, B.A., M.L.I.Sc., PGDCA (Library Assistant)

Administration & Finance

Senior Finance Officer	:	Mrs. Jayashree Muralidharan, M.Com., ACS, CWAI
Junior Admn. Manager	:	Vacant
Personal Assistant to Director	:	Mr. V. Vaidiyanathan, B.Sc.
Administrative Assistant	:	Mr V Vinayaraj, M.Com
Accounts Assistant	:	Mr. S.N. Krishnamoorthy, B.Com.
Office Assistant	:	Mrs. R. Rajalakshmi, B.Com.
Stenographer	:	Mr. M. Eanamuthu, M.A.
Receptionist	:	Ms. M. Jayageetha, B.Sc.
Site Engineer	:	Mr. T.B. Ibrahim Kutty (on contract)
Computer Assistant	:	Mr. K.K. Ramakrishnan, B.Sc., PGDCA (on contract)

INFRASTRUCTURE

Permanent campus

SACON's location at Anaikatty with the backdrop of Western Ghats, one of the 'hot spots' of biodiversity in the world, offers envious opportunities to undertake long term studies on various aspects of its varied avifauna, and on the biological principles and phenomena involved in the maintenance of the fragile systems. The trijunction of Kerala, Tamil Nadu and Karnataka in the Western Ghats, considered to be one of the best wildlife areas in the country having a larger number of Protected Areas, is only within a few hours of drive. SACON sets up field stations in various parts of the country according to the requirements of the research projects.

Construction of the Director's quarter commenced during the year.

Laboratory facilities

With a few additions made during the year, laboratory is now equipped with the following:

- UV Spectrophotometer, Perkin Elmer model Lamda
- HPLC Agilent Technology Model 1100 series with DAD and Floresence detector
- Ultra Deep Freezer (-80'c) New Brunswick
- Atomic Absorption Spectrophotometer (AAS) Perkin Elmer, Model 3300 with 13 lamps for analyzing metal contamination.
- Mercury Hydride Generator Perkin Elmer for analyzing mercury and other hydride forming elements.
- Gas Chromatography Hewlett Packard Model 5890 Series II with three detectors, namely Electron Capture Detector (ECD), Nitrogen Phosphorous Detector (NPD) and Flame Photometric Detector (FPD) for analyzing pesticide residues.
- Microwave Digestion System Milestone Model 1200 for digesting samples for analysis in the AAS.
- High volume air sampler for sampling suspended particulate matters (SPM), oxides of Nitrogen (NOx) and Sulphur (SOx).

The following are being procured

- Graphite Furnace - AAS
- Ultra Centrifuge
- Walk-in cold room

Computer facilities

Each Scientist has been provided with a Pentium PC in addition to the general facility for students and visiting scientists. All are connected with Local Area Network.

Library

An addition of 80 books and electronic version of high impact ornithology journals such as Auk (1990 - 1999), Condor (1991 - 2000), Wilson Bulletin (1889-1919), Studies in Avian Biology (1978-1999) and Journal of Field Ornithology (1990-1999) have been added to the Library.

Total holding of the library is 2655 books, 2358 back volumes of periodicals, 78 current periodicals (Indian-46; International-32), 2706 maps and 31 CD ROM of reference materials including Indian Forester Information System (Vol. 1-125), Birds of Tropical Asia 2: Sounds and sights, Proceedings of 22nd International Ornithological Congress, A bibliographic index to the birds of Indian subcontinent, Global Bird Dictionary (Nomina) and IRS IC/ID digital album.

Facility for literature searches through internet has been provided to the staff and students. As in the previous years, the library facilities were used also by students, scholars and scientists from other institutions around 560 during the year.

HIGHLIGHTS OF THE ACHIEVEMENTS OF THE FACULTY

Dr V S Vijayan, Director

Projects supervised as
Principal Investigator : 5

Projects supervised as Investigator : 3

Supervision of students : 4 (2 for Ph.D)

No. of publications:
Books
- As Senior Author : 1
- As Co-author : 1

Lead a team to draft an outline for the National Wetland Conservation and Sustainable Use Action Plan 2005-2020. Given several seminars and lectures on wetland and biodiversity conservation. Visited 6 research organizations in the United Kingdom and 14 in the United States of America, delivered lectures and held discussions exploring the possibilities of establishing long-term collaborations. Attended the Annual General Assembly of the IUCN held in Thailand and actively participated and contributed in the discussions and resolutions on wetland conservation, Genetically Modified Food and use of pesticides.

Dr Lalitha Vijayan, Senior Principal Scientist, Conservation Ecology

Projects as Principal Investigator : 2
PI along with a Co-PI : 3
Co-Investigator : 4

Supervision of students : 14
Ph. D : 5
M. Phil : 2
M. Sc. : 3
Project Fellows: 4

Publications:
Books (as Co-author) : 2
Reports : 5
Chapter in books : 4
Papers communicated to journal : 1
Abstracts in seminars : 9

Participation in seminars/meetings:
International : 2
National : 7

Served as a resource person in Rajasthan University and MG University Kottayam.

Ecology of the Nilgiri Wood Pigeon and Nilgiri Pipit was documented. The Nilgiri Pipit was recommended to be included under Vulnerable category of the IUCN. Many new locations of the Andaman Crake, a species considered as 'Data Deficient', were recorded; study of its ecology and behaviour is in progress. Made substantial contribution to the knowledge on the bird communities of important habitats or areas, especially in the Western Ghats (Silent Valley National Park, Anaikatty reserve forest), Sikkim Himalayas (Teesta Valley), Andaman Islands, and wetlands (Keoladeo National Park).

Dr R Sankaran, Senior Scientist, Conservation Ecology

Projects undertaken as
Principal Investigator : 3

Students - Ph.D : 1

Publications:
Research reports : 2
Papers published, in-press/accepted/ submitted : 4
In preparation : 1

Professional meetings : 5

Project proposal submitted : 3

Member: Scientific Advisory Committee of WWF-India and MCBT/ANET

As a part of the programme to develop a Protected Area Network of Grasslands in the Western India for the conservation of the Lesser Florican, a new area, Amreli in Junagadh, was added to its distribution range. A project was launched to assess the impact of the Tsunami on the Nicobar Megapode *Megapodius nicobariensis* and the endemic avifauna of the Nicobar Islands that will lead to conservation action plans of the Nicobar Islands post tsunami. The in-situ and ex-situ conservation programme for the Edible-nest Swiftlet with the dual objective of species conservation and economic development of the Andaman & Nicobar Islands made some substantial progress. Apart from these, reviewed papers for journals, contributed to books, taken classes for M.Sc students, examined Ph.D students and given lectures to general audiences.

Dr S Bhupathy, Senior Scientist, Conservation Ecology

EIA projects handled as
Co-Principal Investigator : 3

Research projects : 4
(PI: 2,Co- PI: 2)

Publications:
Published/ accepted/
under review) : 10
(5 in Journals and 5 in Books and Proceedings)

Ph.D. Students : 5
(one as Co-guide)

Served as Ph.D examiner: Madras University, Chennai, and M.G. University, Kottayam

Invited lectures : 3

One of the major achievements during 2004-05 was the description of a new species of reptile from Anaikatty Hills, Coimbatore. The research paper on the same is under review with Journal *Current Science*. Apart from short-listing major conservation problems faced by the marine turtles along the south Indian coast, we were able to network researchers and NGOs in Kerala and Tamil Nadu to continue the sea turtle monitoring in future. Our study on the reptiles of Ervaikulam National Park shows that reptiles distributed in this Protected Area are largely endemic to the high altitude region of the Western Ghats, especially to the montane shola and grasslands.

Dr S Narendra Prasad , Senior Principal Scientist, Landscape Ecology

Projects supervised as
Principal Investigator : 2

Projects supervised as
Investigator : 2

Projects supervised as
Consultant : 2

Supervision of students : 3

Publications:
As Senior Author : 2
As Co-author : 1

The work on ISRO sponsored project on wetlands of UP continued with two JRFs and with collaboration with the Indian Institute of Remote sensing, Dehra Dun. For 38 districts of UP a detailed database was prepared and presented. Field work was supervised in select districts of UP for a rapid assessment of biodiversity.The PDF -A document for preparation of Medium Sized Project for funding by GEF was revised with inputs from UNDP and from various professionals across several institutions. The website on ENVIS project on Wetland Ecosystems was made more exhaustive. As a part of ENVIS activity a

collaborative workshop was held with NRSA, ISRS, Hyderabad chapter and JNTU, Hyderabad in May 2005. Attended several workshops and gave talks on GRASS-a public domain GIS software. Supervised the field work of Anaikatty biodiversity project (Plant component)

P. Balasubramanian, Senior Scientist, Landscape Ecology

Projects handled as
Principal Investigator : 2

Projects handled as
Co-investigator : 1

Students guided : 3
(one each for Ph.D, M.Phil and M.Sc)

Papers published :
Senior author : 2
Co-author : 2

Reports published : 2

Surveyed the status of hornbills in the Western and Eastern Ghats, covering thirty-eight Protected Areas and 30 Reserve Forests and, 611 hornbills of 4 species were sighted. Major hornbill habitats and locations in southern India have been identified. A short-term study on Common Indian Peafowl estimated the peafowl population in and around SACON campus and established its omnivorous habits. In addition, lectures\talks were given at different institutions and to the participants of SACON's Nature Education programme. As part of EIA project on the evaluation of bird habitat in the Pathiramanal Island, vegetation studies were conducted and recommendations offered.

Dr P A Azeez, Senior Principal Scientist, Environmental Impact Assessment

EIAs and other projects undertaken

As Principal Investigator : 5
As Co-Principal Investigator: 2

Publications:
Papers in refereed Journals : 8
Papers presented in symposia : 5
Invited talks in workshops : 5

Supervision of students
Ph.D-2; M.Sc - 4

In collaboration with Dr Bhupathy, completed the study on the proposed ecotourism project in Pathiramanal Island, Kerala, and the bird fauna in Barh Super Thermal Power plant area of the NTPC near Patna. Reports highlight the conservations issues and measures to reduce the impacts.

In the first quarter of 2005, served as a member of the India People's Tribunal (IPT) on the environmental issues of Mettur. The panel report, prepared after field surveys and visit to the affected people, was made public and submitted to the authorities for necessary action. The Chairman of the Panel was Justice A B Kadri of Chennai High Court. Currently, also a member of the Expert Committee appointed by the Chennai High Court to propose measures to ameliorate environmental problems of Tirupur and Noyyal River. The committee is directed by the high court to suggest suitable strategy and identify measures to clean the Orathupalayam reservoir, the largest in the river Noyyal basin.

Dr S Muralidharan, Senior Scientist, Ecotoxicology Division

Projects Undertaken	: 3 (PI: 2, Co-PI:1)
Supervision of students (Ph.D-3; M.Sc.-2)	: 5
Publications	: 7
Co-author	: 2 books
Papers communicated	: 2
Papers presented in seminar	: 3
Invited lectures	: 3

Long-term monitoring of the environmental contamination in Indian avifauna continued. 218 birds from 36 species and, 28 unhatched eggs were analysed. Levels of organocholorine indicative of poisoning were recorded in the Shikra and House Crow.

Organic contaminants in the marine fishes of Coimbatore market and their suitability for human consumption is a new project launched during the this year. 620 fishes of16 species were collected and analysis is in progress.

Dr P Pramod, Nature Education Officer, Nature Education Division

Scientific/Academic activities

Supervision of Research Student	: Ph.D. - 1
Scientific invited lectures	: 6
Publications	: 4
Books (for students)	: 2
Paper in journals	: 2

Nature Education activities

The most significant event of the nature education programme for the year is the Children's Ecological Congress, first of its kind in India. 35 student research projects carried out with participation of 110 students, were presented in a professional style. Proceedings were compiled. Membership of Salim Ali Nature Club network grew from 79 to 102. More than 8000 school students and about 1000 college students benefited from the programmes during the year. 155 lectures were given, 48 nature camps and 55 nature walks were conducted. 1100 students attended the nature competitions. Guest lectures, nature awareness campaign, One-day nature camps, nature camps for student artists and student researches conducted. About 2100 students visited SACON for the one day camps; about 500 students involved in the common bird monitoring of south India, 110 students in specific student projects, 35 students involved in the nature camp for the students artists and, 2500 students visited the exhibition. About 3000 students were benefited from the various other activities such as slideshows and lectures in the schools and nature awareness field trips to forests. Co-authored series of 11 articles in Tamil on ecology and ornithology, published for the children in a popular Jounal *Tulir*, which claims to have a readership of more than a lakh children.

The Salim Ali Naturalist Forum for the elders had 14 discussion meetings/slideshows and four nature education field trips. 120 trees were planted on the occasion of the annual day of the forum.

Two books for students, one on Common birds of Coimbatore and the other Common Butterflies of Coimbatore written in English and Tamil are ready for Press

PUBLICATIONS

Papers

Anitha, K. Balasubramanian, P. and Prasad, S.N. (In press). Tree community and regeneration in Anaikatty hills, Western Ghats. *Indian Journal of Forestry.*

Anjan Kumar Prusty, B., Mishra, P.C. and Azeez, P.A. 2004. Noise level in and around Burla town of Orissa. *Science and Culture* 70(7-8): 265-269.

Anjan Kumar Prusty, B., Mishra, P.C. and Azeez, P.A. 2005. Dust accumulation and leaf pigment content in vegetation near the national highway at Sambalpur, Orissa, India. *Ecotoxicology and Environmental Safety* 60:228-235.

Arun, P.R. and Azeez, P.A. 2004. Vulture population decline, diclofenac and avian gout. *Current Science* 87(5): 565-568.

Balasubramanian, P. and Vijayan, L. 2004. Conservation strategies and Action plans for the Avifauna of Tamil Nadu. In: (Ed.) R. Annamalai, Tamil Nadu Forest Department, *Tamil Nadu Biodiversity Strategy and Action Plan - Chordate Diversity, Tamil Nadu Forest Department.* pp:

Bhupathy, S. 2004. Reptiles. In. *Tamil Nadu Biodiversity Strategy and Action Plan, Chordate diversity.* R. Annamalai (Ed). Tamil Nadu Forest Department, Chennai. pp.62-75.

Bhupathy, S. and Nixon, A.M.A. (Under review) Reptiles of Mukuruthi National Park, Nilgiri Biosphere Reserve, Western Ghats, India. *Hamadryad.*

Bhupathy, S., Nixon, A.M.A. and Debanik Mukherjee (Under review) Aspects of Ecology of *Mabuya allapallensis* (Schmidt 1926) In Kolli Hills, Eastern Ghats, India. *Hamadryad.*

Bhupathy, S., Subramanean, J. and Vijay, M. (Under review). Nesting of *Lepidochelys olivacea* along the South Chennai coast with emphasis on habitat characteristics. *Hamadryad.*

Bhupathy, S. and Webb, R.G. (Under review): Indian Flap shell Turtle (*Lissemys punctata* Bonnaterre, 1879) Species account. *Conservation Biology of Freshwater Turtles.* IUCN/SSC.

Das, A.K.S. and Vijayan, L. 2005. Breeding seasonality of birds in Silent Valley National Park, Western Ghats, Kerala. *In*: A.E. Muthunayagam (Ed.) *Proc. of the XVII Kerala Science Congress* at KFRI, Thrissur, 29-31 January 2005.Pp 183-185.

Debanik Mukherjee, Bhupathy, S. and A. M.A. Nixon (Under review). A new species of day gecko (Squamata, Gekkonidae, *Cnemaspis*) from the Anaikatti Hills, Western Ghats, Tamil Nadu, India. *Current Science.*

Debanik Mukherjee, and Bhupathy, S. 2004. Snake diversity of Anaikatti Hills, Western Ghats, India. In. *Proc. National Workshop on Biodiversity Resources Management and Sustainable use.* (Ed) K. Muthuchelian, Madurai Kamaraj University, Madurai, Tamil Nadu, India. pp. 315 317.

Eswaran, R. and Pramod, P. 2004. Diversity, Emergence and Activity pattern of Butterflies in Anaikatty Hills. *International Journal of Ecology and Environmental Sciences* 30(4): 377-384.

Eswaran, R., and Pramod, P. (Accepted). Community structure of butterflies of Anaikatty Hills. *Zoos Print Journal.*

Gunasekaran, M. and Balasubramanian, P. In Press. Sthalavriksha worship - a tool in plant biodiversity conservation. In: (Ed.) Khunjikannan, *Conservation of Sacred Groves in India,* ICFRI.

Mahajan, M and Azeez, P.A. 2005. Observations on the weed flora of Nilgiri Biosphere Reserve, South India. *Journal of Economic and Taxonomic Botany* 28(3):693-705.

Mohanraj, R. and Azeez, P.A. (In press) Urban Development and Particulate Air Pollution in Coimbatore City, India. *International Journal of Environmental Studies.*

Mohanraj, R. Azeez, P.A. and Priscilla, T. 2004. Heavy Metals in Airborne Particulate Matter of Urban Coimbatore. *Archives of Environmental Contamination and Toxicology* 47(2),162-167.

Muralidharan, S. and Jayakumar, R. 2005. Heavy metal contamination in select species of birds in Nilgiris District, Tamil Nadu, India. *Bulletin of Environmental Contamination and Toxicology* (Communicated).

Muralidharan, S., Dhananjayan, V. and Sankardoss, R. 2004. Impact of agricultural chemicals on the Indian avifauna (1999-2003) - An overview In: *Proceedings of National Workshop on Recent Trends in Pollution Control and Environmental Conservation*, held at Bannari Amman Institute of Technology, Sathyamangalam, Tamil Nadu, India. 15-16th July.

Muralidharan, S., Jayanthi, P. and Dhananjayan, V. (Communicated). Organochlorine pesticide residues in the commercial marine fishes of Coimbatore and their suitability for human consumption. *Ecotoxicology and Environmental Safety.*

Nixon, A.M.A. and Bhupathy, S. (Accepted for publication). Occurrence of *Melanobatrachus indicus* Beddome, 1878 in Mathikettan Shola, Western Ghats. *J. Bombay Nat. Hist. Soc.*

Nixon, A.M.A. and Bhupathy, S. 2004. Impact of plantations on the reptile diversity in Upper Nilgiris, Nilgiri Biosphere Reserve, Western Ghats. In. *Proc National Workshop on Biodiversity Resources Management and Sustainable use.* K. Muthuchelian (Ed)., Madurai Kamaraj University, Madurai, Tamil Nadu, India. pp. 311 314.

Seedikkoya K, Azeez, P.A. and Shukkur, E.A.A. (In Press) Cattle egret habitat use and association with cattle. *Forktail* .

Somasundaram, S. and Vijayan, L. 2004. Avifauna of Palni Hills: a Conservation perspective. *In: Proc. of National Workshop on "Biodiversity Resources management and Sustainable Use"* (Ed. K.Muthuchelian) Centre for Biodiversity and Forest Studies, School of Energy, Environment and Natural Resources, Madurai Kamraj University, Madurai, India. Pp 318-322.

Somasundaram, S. and Vijayan, L.(communicated) "Foraging guild structure of birds in the montane wet temperate forest of Palni Hills, South India. *Ornithological Science.*

Vijayan, L. (in press). Ecology and Conservation of the Andaman Teal. *In*: A look at threatened species. *Proc. JBNHS Centenary seminar, Bombay Natural History Soc.*

Books

Vijayan V.S., Prasad, S.N., Vijayan, L. and Muralidharan, S. 2004. *Inland Wetlands of India - Conservation Priorities.* Salim Ali Centre for Ornithoglogy and Natural History, Coimbatore. pp xxiv + 532.

Prasad, S.N., Tiwari, A. K., Kumar, A., Kaushik, P., Vijayan, L., Muralidharan, S. and Vijayan, V. S. 2004. *"An Atlas on Inland Wetlands of India"* Salim Ali Centre for Ornithoglogy and Natural History, Coimbatore, 222 pp.

Popular Books

Pramod P., Gomathi. N., Eswaran, R. and Edward, R. 2005. *Environment in student perspective.* Published by SACON, Coimbatore. 118 pp.

Sashi Kumar, C., Pramod, P. and Palot, M.J. 2005. *Bird Life of Aralam* Published by Kerala Forest Department (Book).

Vijayan, V.S., Prasad, S.N, Vijayan, L. and Muralidharan, S. 2004. Inland wetlands of India: conservation priorities. Executive summary (booklet).Pp16. SACON.

Reports

Azeez, P.A., Bhupathy, S. Arun, P.R. 2005. Study of the migratory birds in the environs of the proposed Barh Super Thermal Power Project, National Thermal Power Corporation Limited. Report Submitted to National thermal power corporation Limited, New Delhi.

Azeez, P.A., Bhupathy, S. Balasubramanian, P. and Arun, P.R. 2004. Study of bird habitats at the Pathiramanal Island, Vembanad Lake, Kerala in view of the proposed eco-tourism project, Report Submitted to the Government of Kerala.

Arun, P.R. and Azeez, P.A. 2004. Decline in the yield of Sapota (*Manilkara achras*) from the orchards of Dahanu Taluka: Causes and Concerns - An

ecological investigation. Report Submitted to Dahanu Environment Protection and Welfare Association.

Balasubramanian, P., Vijayan, V.S., Prasad, S.N., Ravi, R. and Krishnakumar, N. 2005. Status survey of the Hornbills in the Western Ghats, *SACON Report.*

Vijayan, L. and Prasad, S.N. 2004. A study on the population and habitat suitability of the Nilgiri Laughing Thrush. Final report. SACON. Pp29.

Vijayan, L., Bhupathy, S., Kumar, A., Thapa, J., Acharya, B.K, Chettri, B. and Riphung, S. 2004. An Ecological study on mammals,birds,herpetofauna and butterflies in Teesta basin, Sikkim. Report of Phase II 2003-2004. SACON.Pp123.

Vijayan, L. and Narayanan, P.S. 2004. Status and ecology of the breeding wetland birds in the KTDC Tourist complex, Kumarakom, Kerala. SACON. Pp92.

Vijayan, L. and Nirmala, D. 2004. Non-Breeding ecology of the Pied Bushchat *Saxicola caprata*.SACON.Pp54.

Vijayan, L. and Ezhilarasi, N. 2004. Habitat utilization of the Andaman Crake *Rallina canningi.* SACON.Pp 88.

Seminar/ Symposia/ Conference

Balasubramanian, P. 2004. Ecology of seed dispersal by birds. In: *Proceedings of the UGC seminar on Biodiversity Conservation in India,* Vellalar College for Women, Erode, Tamil Nadu.

Balasubramanian, P. Attended the UGC sponsored, National Seminar on Current Trends in Biological Scenario held at Erode, Tamil Nadu.

Balasubramanian, P. Attended the "National Workshop on Conservation of Sacred Groves", held at Calicut, Kerala.

Bhupathy, S. Reptile Research in India: An overview. A.V.C. College, Mayiladuthurai. 25-26 February 2005 (Invited Lecture).

Bhupathy, S. Sea turtle project- investigators meeting, ATREE, 1st November 2004, Bangalore.

Bhupathy, S. Carrying capacity of Teesta Basin in Sikkim. Principal investigators meeting, 27th September 2004, Centre for Inter-disciplinary Studies of Mountain and Hill Environment, University of Delhi South Campus. New Delhi.

Das, A.K.S. and Vijayan, L. 2004. The nest site and breeding biology of an under storey bird, Brown-cheeked Fulvetta in Silent Valley National park, Southern India. In International Conference on Bird and Environment. Dept. Zoology and Environment science, Gurukula Kangri University, Haridwar, India. 21-24 November 2004.

Das, A.K.S. and Vijayan, L. 2004. Butterfly Community of Silent Valley National Park: A preliminary Investigation .*In*: National seminar on Butterfly diversity of Western Ghats. N.S.S College, Manjery, 7-8 October 2004.

Das, A.K.S. and Vijayan, L. 2004. Ornithological studies in Silent Valley National Park, Southern Western Ghats, Kerala: a retrospective. *In*: National Seminar on Biodiversity Conservation S.D. College, Alapuzha. 8-10 October 2004.

Dutta, A., Vijayan, L. and Vijayan, V.S. Monitoring the wetland birds of Keoladeo National Park, Bharatpur I Annual Research Seminar for Keoladeo National Park, Bharatpur. 22-23 December 2004. (Abstract).

Mohanraj, R. and Azeez, P.A. 2004. Aerosols of urban Coimbatore, India with emphasis on its elemental, ionic and PAH constituents. American Association for Aerosol Research 2004 Annual Conference, October 4-8, 2004, Atlanta, USA.

Muralidharan, S., Jayanthi, P. and Dhananjayan, V. Pesticide residues in marine fishes available in Coimbatore market and their suitability for human consumption. In the National seminar on "Conservation of Agro-Biodiversity in India-The role of stakeholders" held during December 27-30, at GRD College of Science, Coimbatore. pp 102.

Muralidharan, S., Dhananjayan, V. and Jayakumar, R. Environmental contaminants in a few species of raptorial birds in India. Workshop on Current Status of Vultures in Gujarat, organized by Bird Conservation Society, Gujarat (BCSG) held on 19th September 2004, Gujarat Agriculture University, Anand, Gujrat.

Muralidhran,S Agricultural chemicals and Indian Avifauna: An overview. National seminar on Wildlife Conservation. A V C College, Mayiladuthurai, held on 2-26 Feb 2005

Pramod, P. "Research Education synergy for Biodiveristy conservation", Invited lecture given in the Symposium on Conserving India's Biological diversity -Cum- Brainstorming session on CBD at Indian Institute of Science, Bangalore on 31st May to 2nd June 2004.

Pramod, P. "Ornithological databases in India: Past, Present and Future" Invited lecture in Workshop on Regional Cooperation on Conservation of Biodiversity Hotspots of the Indian Subcontinent and Taxonomic databases for Conservation at ATREE, Bangalore on 30 August to september 1st 2004.

Pramod, P. "Ecology of butterflies in Western Ghats" Seminar given at Centre for Ecological Sciences, Indian Institute of Science, Bangalore on 2nd September 2005.

Pramod, P. " Nature Education for Biodiversity conservation" in Department of Zoology, Bharthiar University, Coimbatore on 23rd September 2004.

Pramod, P. " Conservation of Biodiversity in India" in State Forest Service College, Coimbatore on 5th October 2004.

Pramod, P. " Nature Education for Biodiversity Conservation : A case study" presented in the International Conference on Education for Sustainable Development, at Ahmedabad on 18th to 21st january 2005.

Prusty, B.A.K. and Azeez, P.A. Seasonal variation in water chemistry of a monsoonal wetland. Water Vision-2004, PSGR Krishnamal College for Women, Coimbatore, 6 - 8 October, 2004.

Prusty, B.A.K. and Azeez, P.A. Wetlands: Efficient systems for waste water treatment". National Conference on Environmental Pollution Control and Repercussions (EPCR)-04, KUVEMPU University, Davangere, Karnataka, 4 - 5 October, 2004.

Prusty, B.A.K. and Azeez, P.A. Sustainable Development: A Key Environmental Debate. National Conference on Advances in Water and Wastewater Treatment Technologies (AWWT)-05, KUVEMPU University, Davangere, Karnataka, 7 - 8 January, 2005.

Somasundarm, S. and Vijayan, L. 2004. Impact of habitat alteration on the Greybreasted laughingthrush in the Palni hills, South India. *In*: International Conference on Bird and Environment. Dept. of Zoology and Environment science, Gurukula Kangri University, Haridwar India. 21-24 November 2004.

Umamaheswary, J. and Vijayan, L. 2004. Species diversity in montane grasslands, Upper Nilgiris. *In*: National conference on Biodiversity Conservation, S.D. College, Alapuzha, Kerala 8-10 October 2004.

Umamaheswary, J. and Vijayan, L. 2004. Habitat use by nesting grassland birds in Upper Nilgiris, S.India.*In*: International Conference on Bird and Environment. Dept. Zoology and Environment science, Gurukula kangri University, Haridwar, India. 21-24 November 2004.(Abstract).

Vijayan, L. Review meeting of the Eastern and Western Ghats programme of the MoEF, Govt.of India. Presented the progress of the project on the Nilgiri Wood Pigeon and Nilgiri Pipit. 17 February 2005.

Vijayan, L. Prioritization of the inland wetlands of India; National Seminar on Inland Wetlands of India, Delhi. 15-16 February 2005

Vijayan, L. Projects review meeting at DBT, Delhi: presented the progress during 2004 of the project "Avifaunal diversity of Andaman Islands and their conservation". 14 January 2005.

Vijayan, L. and Amlan Dutta. Population monitoring of waterfowl in Keoladeo National Park. First Annual Research Seminar for Keoladeo National Park, Bharatpur. 22-23 December 2004.

Vijayan, L. Workshop on the Conservation and Development of the Andman Islands at IIPA Delhi. Gave an invited talk on the "Andaman Nicobar Islands: Conservation perspectives". 25 November 2004.

Vijayan, L. International Conference on Bird and Environment at Gurukula Kangri Univ.

Haridwar, Gave an invited talk on the "Conservation of Avifauna in the Andaman Islands" on 22nd and a plenary lecture on the "Conservation of wetland birds in India" 22-24 Nov 2004.

Vijayan, L. Talk at Vansadan, Port Blair to the forest officials on the Bird studies and conservation in the Andaman Nicobar Islands. 28 September 2004.

Vijayan, L. Ist Governing body meeting of the Island Development and Training Institute, Andaman Nicobar Islands, Port Blair. Participated actively representing the Director, SACON. 27 September 2004

Vijayan, L. Workshop on "Status of vultures in Gujarat" organized by the Bird Conservation Society of Gujarat, Anand, Presented a paper on the "Causes of Decline of vultures in India", also chaired a session on the status of vultures in Gujarat and submitted the report. 19th September 2004

Vijayan, L. Wetland biodiversity conservation in India. South Asia Regional Consultation workshop of wetlands International, New Delhi. 8-9 September 2004.

Vijayan, L. Invited lecture at Government Arts College, Coimbatore on "Bird studies and Conservation" in connection with the Golden Jubilee Celebrations of the Dept. of Zoology and Research Centre. 11 August 2004.

Vijayan, L. 2004. Conservation of Avifauna in the Andaman Islands.*In*:International Conference on Bird and Environment. Dept. of Zoology and Environment science, Gurukula Kangri University, Haridwar, India. 21-24 November 2004.(Abstract).

Vijayan, V.S., Vijayan, L., Prasad, S.N. and Muralidharan, S. 2004. Conservation of wetland birds in India. *In*: International Conference on Bird and Environment. Dept. of Zoology and Environment science, Gurukula Kangri University, Haridwar, India. 21-24 November 2004.(Abstract).

Lectures/ Talks

Azeez, P.A. Invited Lecture "National workshop on recent trends in pollution control and environmental conservation" organised by Bannari Amman Institute of technology, Sathymangalum, 15-16 July 2004.

Azeez, P.A. Invited Lecture on "Interlinking rivers" in the symposium on "Sustainable Water Management". Organised by PSGR Krishnammal College for Women, Coimbatore. 9 September 2004.

Azeez, P.A. Resource person, Invited lecture "Assessment of baseline environmental status and biological impacts: Concepts and methods" in short term training programme on "Environmental Impact Assessment and modern methods of analysis and treating of industrial wastes". Organised by Kumaraguru College of Technology, 26 November 2004.

Azeez. P.A. Invited Lecture on marine pollution, World Environment Day 2004, organised by Tamil Nadu Pollution Control Board and PSG College of Arts and Sciences, 9 July 2004.

Azeez. P.A. Resource Person, invited lecture, "Need based Refresher Course in Environmental Education" Academic Staff College, Bharathiar University, 26 May to 15 June 2004.

Balasubramanian, P. A lecture on "Bird-plant interactions" was delivered for ACF trainees at SFSC, Coimbatore.

Balasubramanian, P. A lecture on "Forest and Wildlife Conservation" was delivered at the PSGR Krishnammal College, Coimbatore.

Muralidharan, S Impact of pesticides on birds. Lecture delivered to in-service Forest Officers at SFSC,Coimbatore, on 9 July & 17 October 2004

Popular articles

Pramod, P. and Revathy, M. 2004 'Vazhaninaithal Vaazhalam - Vazhikaatum paravaikal' Tulir:April 4-5 Published by Tamilnadu Science Forum & NCSTC/ DST.

Pramod, P. and Revathy, M. 2004 'Inayei thedum iniyamuyarchikal' Tulir: May 3-4 Published by Tamilnadu Science Forum & NCSTC/DST.

Pramod, P. and Revathy, M. 2004 'Indiaya Paravai iyalin thanthai- Dr. Salim Ali' Tulir:June 3-5 Published by Tamilnadu Science Forum & NCSTC/DST.

Pramod, P. and Revathy, M. 2004 'Ulakai valam varum ullasa payanikal' Tulir:July 4-5 Published by Tamilnadu Science Forum & NCSTC/DST.

Pramod, P. and Revathy, M. 2004 'Paravakalin Udal Amaippu' Tulir:August 4-5 Published by Tamilnadu Science Forum & NCSTC/DST.

Pramod, P. and Revathy, M. 2004 'Paravakalai uttru nokkuvom' Tulir:September 4-6 Published by Tamilnadu Science Forum & NCSTC/DST.

Pramod, P. and Revathy, M. 2004 'Innisai Paadivarum Ilam Paravaikal' Tulir:October 3-5 Published by Tamilnadu Science Forum & NCSTC/DST.

Pramod, P. and Revathy, M. 2004 'Poruppu mikka pettror' Tulir:November 3-5 Published by Tamilnadu Science Forum & NCSTC/DST.

Pramod, P. and Revathy, M. 2004 'Paravakalai apakka nalla neram enna - I' Tulir:December 3-4 Published by Tamilnadu Science Forum & NCSTC/DST.

Pramod, P. and Revathy, M. 2004 'Paravakalai apakka nalla neram enna - II' Tulir:January 5-6 Published by Tamilnadu Science Forum & NCSTC/DST.

Pramod, P. and Revathy, M. 2004 'Manitha kulathin makathana nanparkal' Tulir: February 3-5 Published by Tamilnadu Science Forum & NCSTC/DST.

APPENDIX I. MEMBERS OF SACON SOCIETY

1.	Mr A Raja Hon'ble Minister for Environment & Forests, Govt. of India Mr. Ramesh Bais (since 19 December 2003) Hon'ble Minister of State for Environment & Forests, Govt. of India
2.	Dr Prodipto Ghosh, IAS (up to February 2005), Secretary, MoEF Mr Suresh Chandra, IAS (Since March 2005) Special Secretary to the Govt. of India & Chairman - SACON (GC) Ministry of Environment and Forests Parayvaran Bhawan CGO Complex, Lodhi Road New Delhi - 110 003
3.	Mr S P Elangovan, IAS (up to July 2004) Mr Ajay Bhattacharya, IAS, from August 2004 to March 2005 Secretary to the Govt. of Tamil Nadu Dept. of Environment and Forests Govt. of Tamil Nadu Fort St. George , Chennai - 9
4.	Mr Niranjan Pant, (up to February 2005) Mr P K Mishra, IAS (since March 2005) Addl. Secretary and Financial Advisor Ministry of Environment and Forests Govt. of India, Paryavaran Bhawan CGO Complex, Lodi Road New Delhi - 110 003
5.	Dr A R Rahmani Director Bombay Natural History Society Hornbill House, Shaheed Bhagat Singh Road Bombay - 400 023
6.	Prof. S Sivasubramanian Vice Chancellor Bharathiar University Maruthamalai Road Coimbatore - 641 046
7.	Dr N V Joshi (up to June 2004) Dr R Sukumar (since July 2004) Chairman Centre for Ecological Sciences Indian Institute of Sciences Bangalore - 560 012
8.	Dr R Uma Shannker (since August 2004) University of Agricultural Sciences Department of Crop Physiology GKVK Bangalore - 560 065
9.	Dr Pratap Saraiya 12-B Suneeta B G Kher Marg Mumbai - 400 006
10.	Mr Cyrus Guzder Airfreight Pvt. Ltd Neville House, Ground Floor Currimbhoy Road, Bellard Estate Mumbai - 400 036
11.	Mr K P Karamchandani (up to .....) 503 Atur Terrace Cuffe Parade, Coloba Mumbai - 400 005
12.	Dr K K Tiwari, Ex-Director Zoological Survey of India B - 278 Shahapura Bhopal - 462 016 Madhya Pradesh
13.	Mr Samar Singh, IAS P-1, Hauz Khaz New Delhi - 16
14.	Prof Shekhar Singh C-17A, Munirka New Delhi - 110 067
15.	Dr Arun Nivakagar Chairman University Grants Commission Bahadurshah Zafar Marg New Delhi - 110 002
16.	Dr S Z Qasim A - 15, Defence Colony New Delhi - 110 024

17.	Dr Sukumar Devato Director National Environmental Engineering Research Institute (NEERI) Nehru Marg Nagpur - 440 020
18.	Mr B Vijayaraghavan IAS (Retd.) Chairman Chennai Snake Park Raj Bhavan Post CHENNAI - 600 022
19.	Mr N R Krishnan IAS (Retd) 2nd Floor 18 Balaji Nagar, 2nd street Royapetta Chennai- 600 014
20.	Dr C Ramasamy Vice Chancellor Tamil Nadu Agricultural University Coimbatore - 641 003
21.	Mr Aasheesh Pittie Bird Watchers' Society of Andhra Pradesh 8-2-545 "Prem Parvat" Road No 7, Banjara Hills Hyderabad - 500 034
22.	Mr S S Ramachandra Raja Wildlife Association of Ramnad District 58 PSK Nagar Rajapalayam - 626 108 Tamil Nadu
23.	Mr N K Joshi, IFS Director General of Forests Ministry of Environment and Forests, Paryavaran Bhawan, CGO Complex New Delhi - 110 003
24.	Dr Robert B Grubh COSMOS, II Main Street Christopher Nagar (Extension) Nagercoil - 629 003
25.	Mrs Tara Gandhi C/o Mr Gopalkrishna Gandhi Raj Bhawan Kolkata
26.	Dr Ashish Kothari Kalpavriksh, Apartment-5 Shri Dutta Krupa 908 Deccan Gymkhana Pune - 411 004
27.	Mr S A Hussain A - 104 "Casa Grande" Attavar, Mangalore. 575 001. D.K. Karnataka. India
28.	Mr Zafer Futehally No.2205 Oakwood Apartments Jakkasandra Layout Koramangla, 3rd Block, 8th Main Road BANGALORE - 560 034
29.	Mr J C Daniel 16/186 Chander Niwas Sion (East) Mumbai - 400 022
30.	Mrs D S Variava Director, Bharat Tiles 32-B Samachar Marg Mumbai - 400 023
31.	Dr B F Chhapgar E/31 Cusrow Baug Colaba Causeway Mumbai - 400 005
32.	Mr K P Geethakrishnan, IAS (Retd) K-15 Anna Nagar (East) Chennai - 600 102
33.	Mr N D Jayal IAS (Retd) Co-ordinator The Himalaya Trust 274/II, Vasant Vihar Dehra Dun - 248 006
34.	Mr Lavkumar Kacher 14 Jayant Society Rajkot - 360 002 Gujrat
35.	Dr M S Swaminathan M S Swaminathan Research Foundation 3rd Cross Street Taramani Institutional Area CHENNAI - 600 113
36.	Dr M K Ranjitsinh IAS (Retd) Indian National Trust for Art and Cultural Heritage (INTACH) 71, Lodi Estate New Delhi - 110 003

37.	Dr H Y Mohan Ram 194, SFS DDA FLATS Mukherji Nagar Delhi - 110 009
38.	Dr Madhav Gadgil Centre for Ecological Sciences Indian Institute of Science Bangalore - 560 012
39.	Mr R Rajamani IAS (Retd) 8-2-585/A/1 Road No.9 Banjara Hills Hyderabad - 500 034
40.	Mr T K A Nair IAS (Retd) Principal Secretary to the Prime Minister Office of the Prime Minister South Block New Delhi
41.	Mr Prakash Gole Ecological Society I/B Abhimanshree Housing Society off; Pashan Road Pune - 411 008
42.	Dr (Mrs) Priya Davidar Salim Ali School of Ecology Pondicherry University R V Nagar, Kalapet, PONDICHERRY - 605 014
43.	Mr P Kannan Plot No. 126, 14th Street Choudhary Nagar Valasaravakkam Chennai - 85
44.	Dr Digvijay Sinh 'The Palace' WANKANER - 363 621 GUJARAT
45.	Mr Bittu Sahgal Sanctuary Asia 602, Maker Chambers V Nariman Point Bombay- 400 021
46.	Dr A N D Nanavati C/o. S Nanavati Sundervan Flat Rasala Marg AHMEDABAD - 380 006
47.	Mr R G Soni, IFS up to ..... (Mr R P Kapoor, IFS since ..) Principal Chief Conservator of Forests Govt. of Rajasthan Van Bhawan Jaipur - 302 005
48.	Mr M L Sharma, IFS Principal Chief Conservator of Forests Block No. 14 Dr Jivraj Mehta Bhavan Govt. of Gujarat Gandhi Nagar - 382 010
49.	Mr S R Mehta, IFS, (up to..... 2004) Mr S.K. Raha, IFS (Up to .....2004) Mr M B Lal, IFS ; since .... 2005 Principal Chief Conservator of Forests Govt. of Arunachal Pradesh Itanagar - 791 111
50.	Mr S S Patnaik, IFS (up to.....) Mr S R Mehta, IFS (since .....) Principal Chief Conservator of Forests Andaman and Nicobar Islands Complex Van Sadan Port Blair - 744 102
51.	Dr J R B Alfred Director Zoological Survey of India Prani Vigyan Bhavan M Block, Alipore Kolkata - 700 053
52.	Dr P Balasubramanian Senior Scientist Division of Terrestrial Ecology SACON Coimbatore
53.	Dr S Muralidharan Senior Scientist Division of Ecotoxicology SACON Coimbatore
54.	Dr S Kaul Director Ministry of Environment and Forests Paryavaran Bhawan CGO Complex, Lodhi Road New Delhi -110 003

55.	Mr Darshan Shankar Director Revitalization of Local Health Traditions (FRLHT) No. 74/2 Jarakbande Kavel Via- Atturpo Post Yalahanka Bangalore - 560 064 Since Sept 2003
56.	Prof. Maroli K. Chandrashekaran Chairman, Evolutionary and Organismal Biology Unit Jawaharlal Nehru Centre for Advanced Scientific Research Jakkur, PO Box No. 6436 Bangalore- 560 064 Since Sept 2003
57.	Prof Bonny Pilo Professor of Zoology M S University of Baroda Vadodara - 390 002 Gujarat Since Sept 2003
58.	Mr Thomas Mathew Wildlife Trust of India C-644, New Friends Colony New Delhi 110 065
59.	Mrs Nanditha Krishna Honorary Director CPR Environmental Education Centre 1, Eldams Road Chennai - 600 018
60.	Dr. R. K. Pachauri Director General Tata Energy Research Institute (TERI) Darbari Seth Block Habitat Place, Lodi Road, New Delhi - 110003
61.	Prof J S Singh Department of Botany Banaras Hindu University Varanasi - 221 005
62.	Prof C Kameshwara Rao No. 1, Gupta's Layout Southend Road Bangalore -560 004
63.	Dr R R Navalkund Director National Remote Sensing Agency Balanagar Hyderabad 500034
64.	Dr G Marimuthu School of Biological Sciences Madurai Kamaraj University Madurai - 625 021
65.	Dr Y D Singh Director Gujarat Institute of Desert Ecology Patwadi Naka Bhuj (Kachchh) Gujarat - 370 001
66.	Prof V C Soni Department of Biosciences Saurashtra University Rajkot - 360 005 Gujarat
67.	Prof K C Saxena Professor School of Environmental Sciences Jawaharlal Nehru University New Delhi - 110 067
68.	Dr P S Roy Dean Indian Institute of Remote Sensing National Remote Sensing Agency 4, Kalidas Road Post Box No.135 Dehra Dun- 248 001
69.	Dr N Mahalingam Chairman Sakthi Group of Companies 180, Race Course Road Coimbatore - 641 019
70.	Dr D Jayavarthanavelu Chairman and Managing Director Lakshmi Machine Works Perianaickenpalayam Coimbatore - 20
71.	Dr G Bhakthavatsalam Chairman K G Hospital Coimbatore - 18
72.	Mr S V Balasubramaniam Chairman Bannari Amman Sugars Limited 252, Mettupalayam Road Coimbatore - 641 043
73.	Mr G K Sundaram Chairman Lakshmi Mills company Limited 1100, Avanashi Road P N Palayam Coimbatore - 37

74.	Mr Kartikeya V Sarabhai Director Centre for Environment Education Nehru Foundation for Development Thaltej Tekra Ahmedabad - 380 054
75.	Dr S Singsit, IFS (up to.....) Dr P R Sinha, IFS (since.....) Director Wildlife Institute of India P B No. 18, Chandrabani Dehra Dun - 248 001 Uttar Pradesh
76.	Mr R P S Katwal Director General Indian Council of Forestry Research & Education P.O. New Forests Dehra Dun - 248 006
77.	Dr. Upendra Dhar Director G.B.Pant Institute of Himalayan Environment & Development Kosi - Katarmal - 263643 Uttar Pradesh
78.	Prof. Gurdeep Singh Head Centre of Mining Environment Indian Schools of Mines, Dhanbad - 826004
79.	Dr M Sanjappa Director Botanical Survey of India CGO Complex - III MSO Building, DF Block, Sector - 1 Salt Lake City Kolkata - 700 064
80.	Ms Veena Chhotray, IAS, Additional Secretary to the Govt. of India (up to..) (Ms Meena Gupta, IAS Special Secretary to the Govt. of India).. since..... Ministry of Environment and Forests Paryavaran Bhawan CGO Complex, Lodhi Road New Delhi - 110 003
81.	Mr D D Verma, IAS (up to.....) Ms Veena Upadhyaya, IAS (since ..... Joint Secretary to the Govt. of India Ministry of Environment and Forests
	Paryavaran Bhawan CGO Complex, Lodhi Road New Delhi - 110 003
82.	Mr S K Subramanian, IFS Principal Chief Conservator of Forests & Chief Wildlife Warden Room No. V Floor, MECL Building Seminary Hills Nagpur - 440 006
83.	Mr M C Malakkar, IFS Chief Wildlife Warden RG Baruah Road Guwahati 710 008 Assam
84.	Mr A R Wadoo, IFS (up to.....) Mr C M Seth (since.....) Chief Wildlife Warden Government of Jammu and Kashmir TRC, Srinagar - 180 001 Jammu
85.	Mr Hitesh Malhotra, IFS Chief Wildlife Warden Government of Andhra Pradesh Office of the Principal Chief Conservator of Forests Tuljaguda Complex M J Market Hyderabad
86.	Mr R M Ray Chief Wildlife Warden Government of Karnataka Aranya Bhawvan, 18th Cross Malleshwaram Bangalore - 560 003
87.	Mr P K Surendranathan Asari, IFS Principal Chief Conservator of Forests Government of Kerala Forest Headquarters Vazhuthacaud Trivandrum - 695 014
88.	Mr K K Singh, IFS Chief Wildlife Warden Govt. of West Bengal Bikash Bhawan 3rd Floor, North Block Salt Lake Kolkata - 700 091
89.	Dr. V.S. Vijayan Director, SACON Member Secretary